THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1795.] LONDON, OCTOBER 5, 1897. [49TH YEAR. PRICE 6d.

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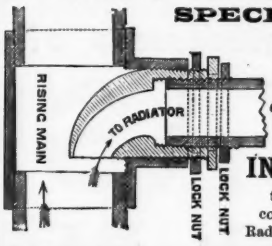

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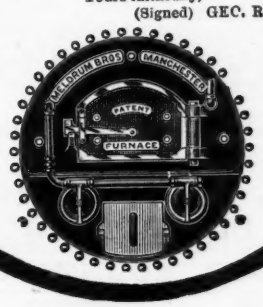

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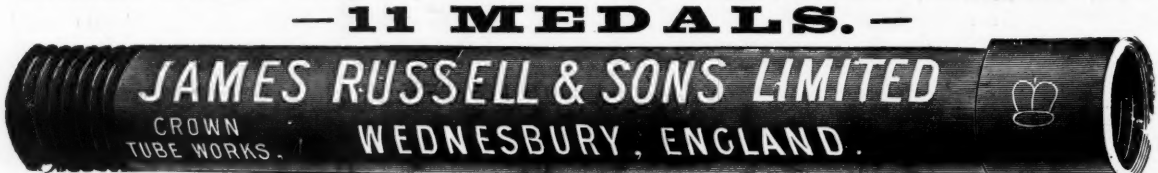

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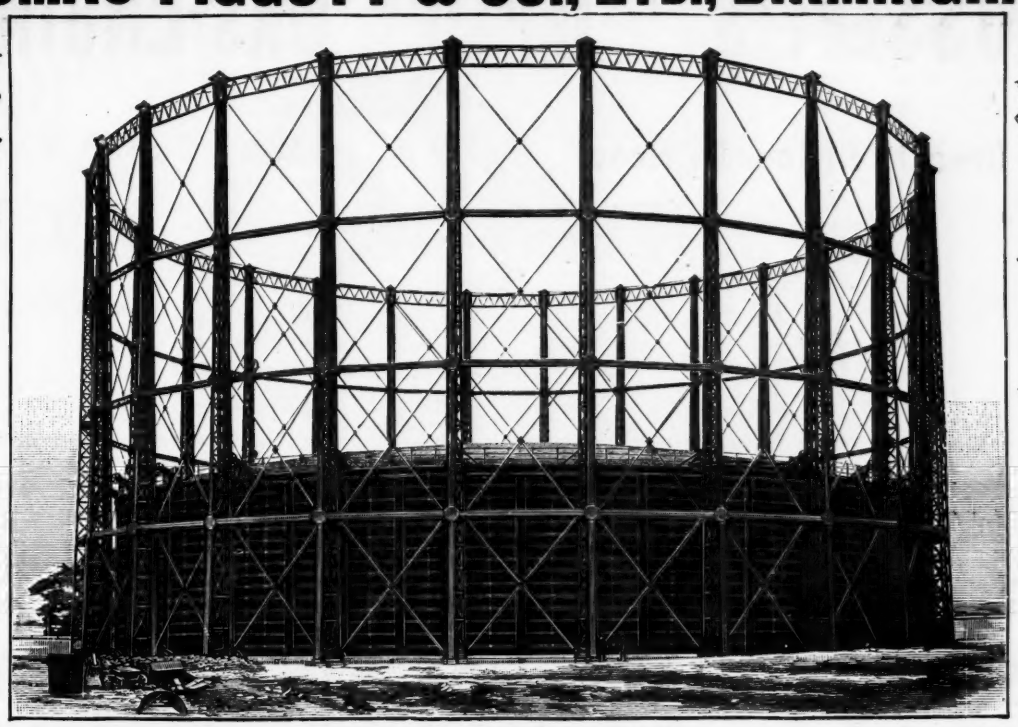

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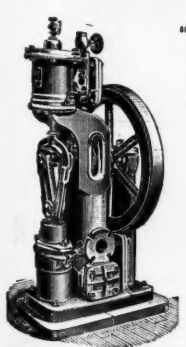

Fig. 703. "SINGLE RAM" STEAM-PUMP.

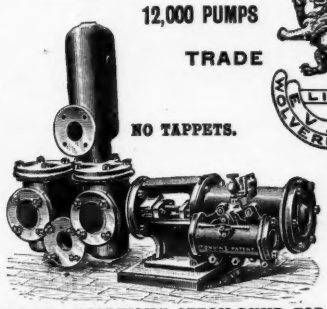

Fig. 898. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

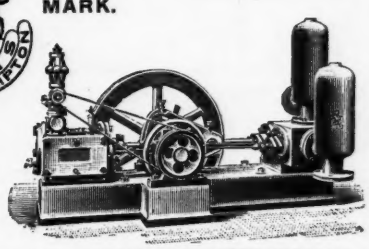

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

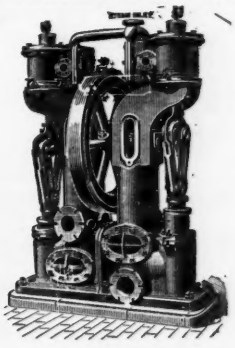

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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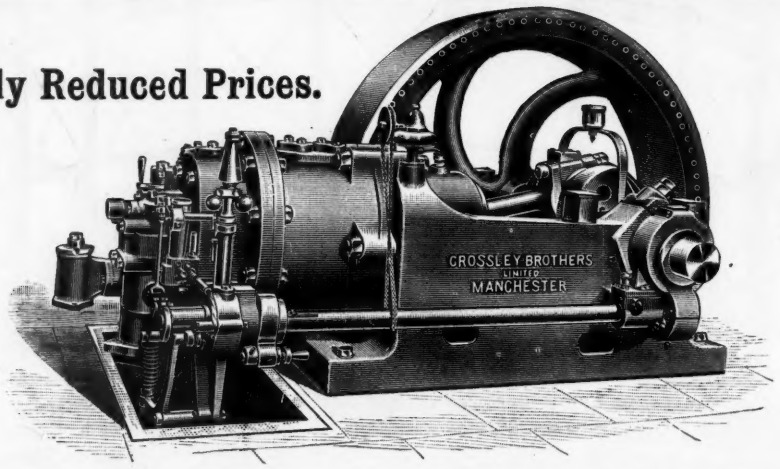

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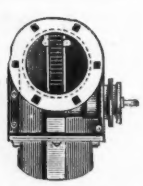

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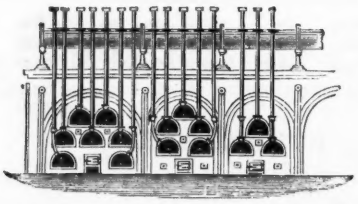

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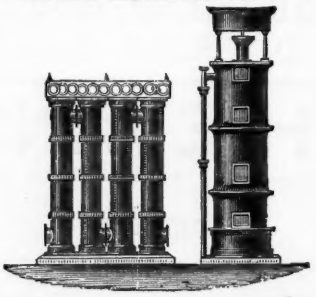

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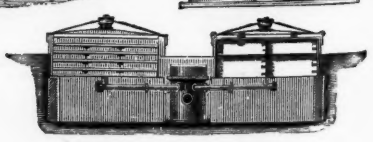

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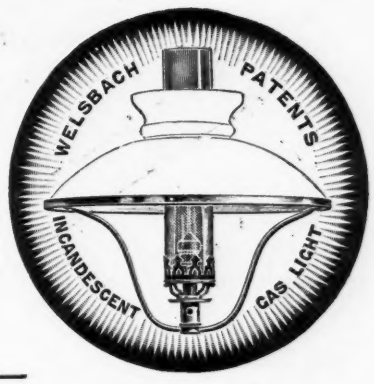

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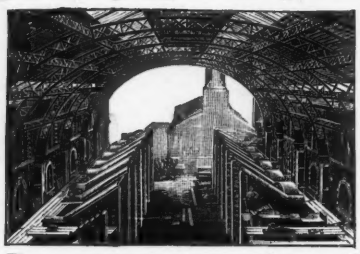

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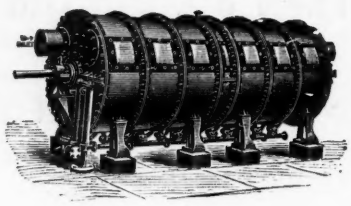

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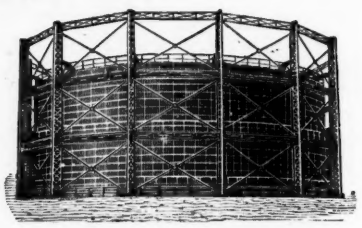

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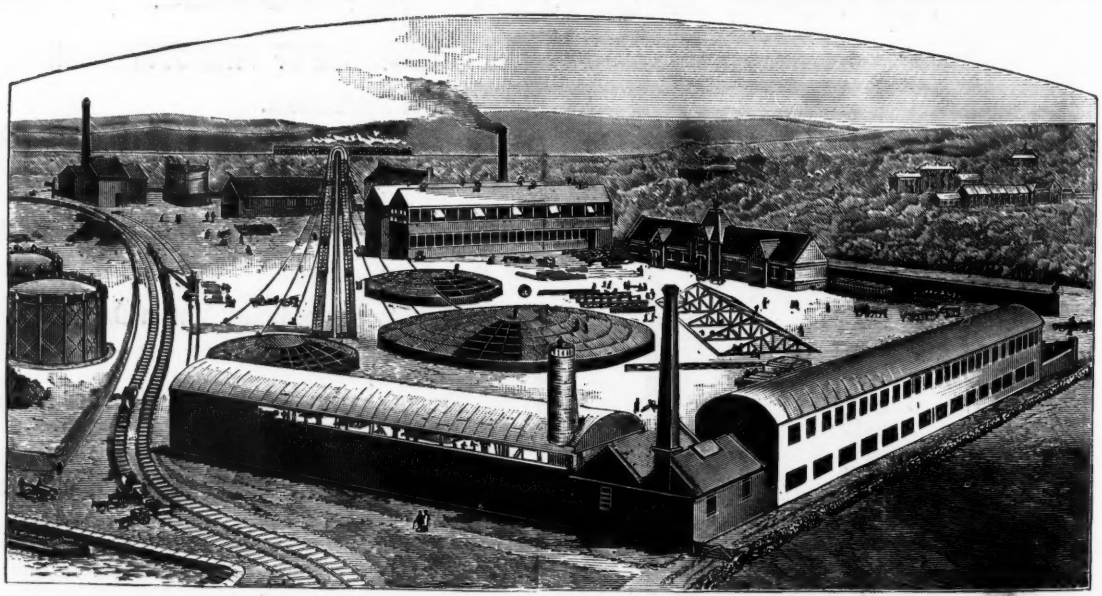

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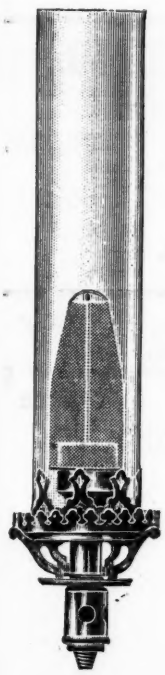

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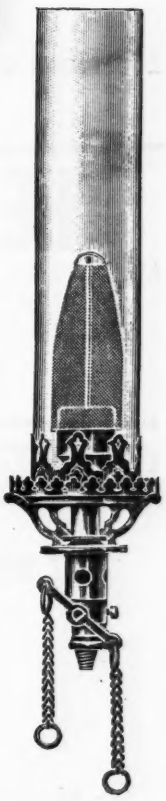

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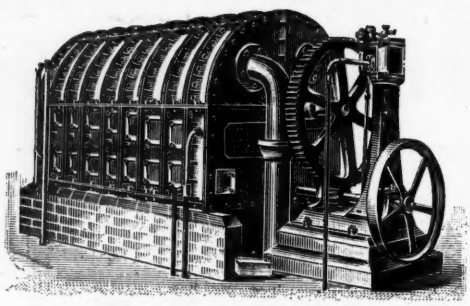

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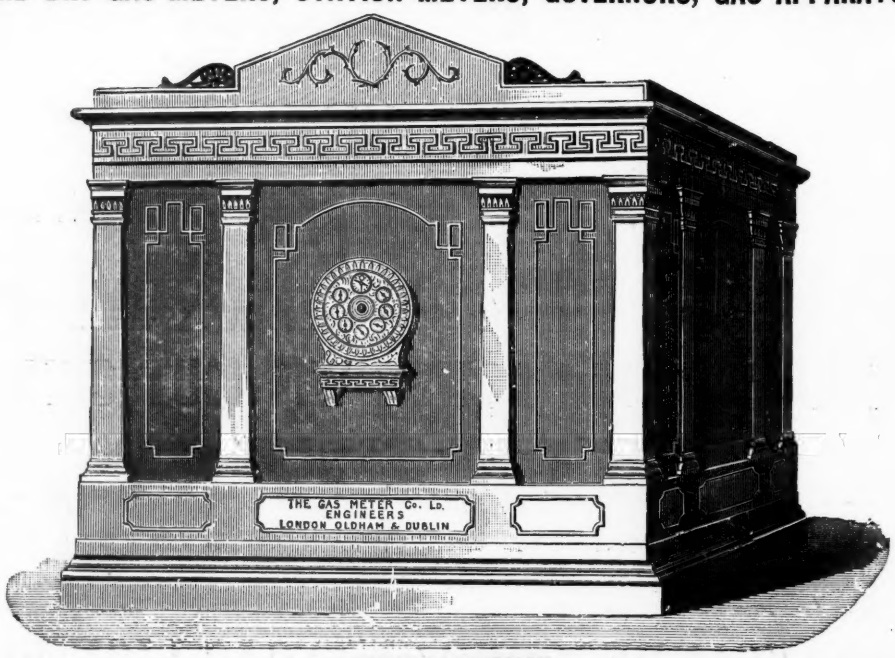

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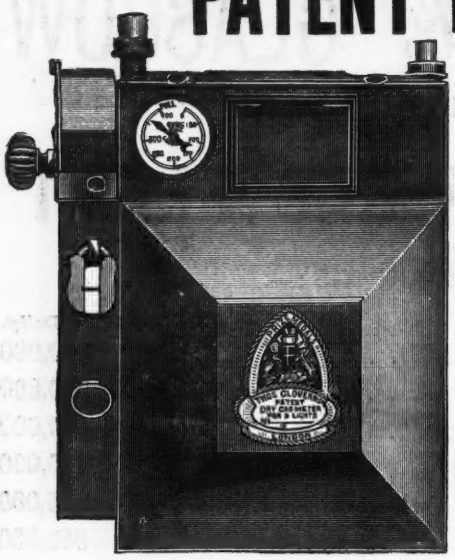

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EDITORIAL NOTES.

"Navis Sacra."

THE current number of "Blackwood's Magazine" contains a somewhat interesting, if discursive, article bearing the title "Navis Sacra." It was suggested to the writer, who is anonymous, by the newspaper report of Messrs. Yarrow's experiment, mentioned in the "JOURNAL" at the time, of lodging their new hands in a steamship moored opposite the works. This is just the sort of thing to strike the ordinary observer of passing events. The temporary housing of emergency workmen in sheds and shanties run up for the purpose inside works that happen to be made the scene of an industrial "unpleasantness" is no novelty, nor would it move a newspaper writer or even a reviewer to do more than record the circumstance. But to actually hire a ship as a safe place of refuge for emergency hands until Trade Union tyranny shall be overpast—here is a proceeding calculated to stir the imagination and provoke the flow of journalistic comment. The writer in "Blackwood" is, of course, taken straight back to "our old friend the Mons "Sacer," which used to be the type of a place of refuge from tyrants' rage. Nowadays, however, the only practicable tyranny known comes from the once down-trodden plebeians themselves. The writer sarcastically observes that since the Legislature, in its wisdom, decided that conspiracy is not conspiracy if the conspirator has less than three or four pounds a week, this kind of tyranny has been common enough. Hence the need for some such institution as the Ship of Refuge. "The waves appropriately "provide some sort of refuge for those Britons who do not "in their crassitude perceive that to be slaves to Mr. "John Burns and Mr. Tom Mann is not slavery at all, but "the noblest freedom." More seriously, the writer argues that there is now a time and opportunity for some competent politician to enter the arena of public life against the Trade Union "bull," with the object of "throwing "him." It is sagely observed that no Government will undertake the enterprise, for fear of becoming unpopular. "But what is not beyond the bounds of possibility is the "attempt to show Governments that the curbing of Trade "Union excesses need not be unpopular after all." The writer thinks "it is capable of being shown to any but the "least intelligent workman that strikes have never brought "to the average striker much, if any, good; that they "have brought that average striker to distinct disaster in "some cases, and to unquestionable discomfort in many; "and that seats in Parliament, places, allowances, railway "fares, hotel expenses, and other things, do most certainly "come out of his own pocket, and do most uncertainly ever "return in any form thereto." The obvious professional agitator's retort to this would be that whoever talks in such a strain has the nefarious design of "smashing the Unions." This is the favourite catchword of the militant Trade Unionists of the day. Of course, it is a falsehood. The writer freely admits that "the Trade Union, existing for "the purpose of looking after the interests of the trade "generally from the men's side, is, though an institution "capable (as, of course, a Masters' Association is also "capable) of being abused, still a thing which may do "some good and prevent much harm. But a Trade "Union which, directly or indirectly, is allowed to interfere "with freedom of work, is a national nuisance, and to be "abated as such." The most practical conclusions of the writer are that picketing should be utterly suppressed and totally abolished; and that the public should never subscribe to any strike relief fund. There are plenty of practical politicians on the look-out for a good "cause." Why do not some of them see whether an acceptable Bill for the suppression of picketing can be drafted? Unless the law can be amended in this sense, the Ship of Refuge, or some equivalent, will still be necessary.

The Affairs of the Commercial Gas Company.

THE report of the Directors and the accounts of the past half-year's working of the Commercial Gas Company have been issued; and the ordinary general meeting at which they will be presented is called for next Thursday. The form of the report is the stereotyped one, giving the figures relating to the revenue and dividend. There has been a net profit for the half year of £47,227, which added to the amount brought forward makes a total of £52,279. Deducting therefrom the sum of £4016 required to pay interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £48,263 avail-

able for division. Therefore the Directors recommend that dividends at the rate of 13½ and 10½ per cent. per annum upon the old and new stocks of the Company should be declared, "and that the difference between the declared "dividends and the authorized amount divisible, having "regard to the price charged for gas, be carried to the "reserve fund." The net profit on the revenue account for the corresponding period of last year was £43,249; so that the Company have gained nearly £4000 upon the six months' working. The accounts show that additional capital to the amount of £62,792 was raised during the half year, which makes the capital account show £9764 to the good. The salient feature of the revenue account is the increased amount of the gas-rental, which has risen from £133,035 to £148,386, in consequence of a remarkable increase of 11·6 per cent. in the quantity of gas accounted for. This is one of the most satisfactory results, having regard to the character of the Commercial district, that has been recorded of late in respect of any gas company's progress. The last is a word which is often misused; but there can be no question of its applicability in this case. In the matter of residuals, the Company share the common lot, though they are more fortunate than some. On the other side of the account, the cost of manufacture has risen from £106,561 to £116,330. There is not much more to be said concerning the accounts. The Company seem to have entered upon a new era of growth; and the undertaking is benefiting accordingly.

Winter Notification of the Referees—Impending Change.

THE customary notification of the London Gas Referees for the coming season would not in the ordinary way call for notice here. The instructions to gas examiners for the performance of their duty are as usual; and the maximum amount of sulphur impurity other than sulphuretted hydrogen allowed is the ordinary winter figure of 22 grains in 100 cubic feet. At the end of the notification, however, there occurs the following special notice: "It is the inten- "tion of the Gas Referees to make extensive changes in "the mode of testing the illuminating power of gas, and "to establish uniformity in this matter in all the testing- "places. Another notification will be issued as soon as "possible, describing the intended changes." This special announcement will be received with mixed feelings by those who are responsible for the gas supply of the Metropolis, and by the Gas Examiners. The London public, of course, neither know nor care aught for this uninteresting business of gas testing, which merely affects their pockets to the tune of many thousands of pounds yearly. Satisfaction will be felt in technical circles at the intimation that the Referees are going to make a move at last; and there will be keen curiosity experienced for a time as to the nature of the promised movement. The Referees have probably fully decided upon their new policy, but are not quite ready to publish it. The present notification promises that the changes which the Referees are about to make in the mode of testing for illuminating power will be "extensive;" while the work at all the testing-stations is to be made uniform. There cannot be two opinions as to the desirability of the reform indicated in the second part of the programme. With regard to the first part, it would be idle to speculate further respecting the Referees' intentions before the appearance of their promised further notification, which it is to be hoped will not be long delayed.

The Right to Cut Off Gas Supplies.

IT has become customary of late to insert in Gas Acts a clause entitled "Power to Refuse to Supply Persons in "Debt for other Property," the meaning of which is thereby made sufficiently clear. The clause runs as follows: "If "a person requiring a supply of gas has previously quitted "premises at which gas was supplied to him by the Com- "pany without paying all gas or meter rent due from him, "the Company may refuse to furnish to him a supply of "gas until he pays the same." A somewhat hard case reported from Ystrad in our present issue illustrates the need for this protection. The Gas Company were summoned by a widow for cutting off the gas on premises actually in her occupation, because she was alleged to be in their debt for gas supplied to other premises which she had quitted "under a cloud." There was a denial of this indebtedness; the widow asserting that she had not been the responsible tenant of the previously occupied premises. At the hearing, however, the decision of the local Bench did not turn upon this point, but solely upon the construction of section 16 of the Gas-Works Clauses Act, 1847. It was decided that the legal right to cut off gas applies, under this section, only to the premises in respect of which the debt was incurred; and the Company were fined £5 and costs for their action in respect to the other premises. This decision is undoubtedly correct; and it is clear that it is solely with the object of overcoming the difficulty thus created that the new clause above quoted is put into modern Acts of Parliament. Unfortunately for them, the Ystrad Company had no such provision for their own protection when this cause of action arose. They had a Bill in Parliament at the time, in which the clause appears; but their proceedings in the district were just a little too "previous." They will, as a Company, soon cease to care for such matters, as their undertaking is to be acquired by the District Council, who will carry on the business in future under that very protection which the Company did not enjoy soon enough.

The Gas Legislation of the Past Session.

THE customary summary of the Private Bill Legislation of the year relating to gas supply, which we complete in this issue of the "JOURNAL," does not command attention either for the number of Acts of Parliament passed, or the importance of their contents. There has been a recrudescence of the familiar movement for the municipalizing of gas undertakings established by private enterprise; but the properties treated in this way were not individually of great importance. As time goes on, the opportunities for the exercise of this tendency in regard to gas-works must grow fewer. The question of the "expediency" of the transfer of a gas undertaking from private to public ownership only arises in the case of undertakings which have not been in possession of statutory powers, or which have not been in Parliament for a considerable time. Where modern legislative settlements of a gas supply are in force, the question can hardly be raised. It is significant that in many cases where local authorities owning gas-works have had occasion to apply for power to raise fresh gas capital, the period for redemption of such capital has been cut down to thirty years. In no case has the period been extended beyond fifty years. When the rate of interest, 3 per cent., and the rate of repayment, 1½ per cent., are taken into account, and compared with the price at which a similarly situated gas company could raise capital, it is very evident that nothing remains of the usual case for the municipalization of this class of property. Our abstract will repay perusal for several minor points which it discloses for the edification of the drafters of Gas Bills.

The Meeting of the North of England Association.

THE North of England Association of Gas Managers met at Scarborough on Saturday last, under the presidency of Mr. J. Holliday, whose Inaugural Address will be found in another column. After showing how very differently commercial electric lighting has affected the gas industry from what was popularly expected of the competition of the two methods of lighting, Mr. Holliday proceeded to demonstrate how largely gas is used in Scarborough during the daytime. This considerable day consumption of gas is a modern condition of life at Scarborough, and is doubtless determined by the special character of the district. Like everybody else interested in gas, Mr. Holliday wants to see a new lighting appliance put upon the market which shall combine the efficiency of the Auer von Welsbach mantle with the practical convenience of a common flat-flame burner. Only this, and nothing more! Meanwhile, fortunately, there is plenty of demand for gas to be consumed by available means. Turning from considerations of the uses of gas by the consumer, Mr. Holliday criticizes most intelligently the ordinary processes of manufacture and treatment of gas in vogue in gas-works, and exposes the weakness of the common air condenser. He also discusses the position and prospects of the trade in gas residuals; and he awards a certificate of character to carburetted water gas. His statement that "when "used as an auxiliary to coal gas, as is the practice "generally, no circumstances can possibly arise which can "make its use detrimental to the consumer," is definite enough to reassure the most timid spirits. The further observation that the proposed departmental inquiry by the Local Government Board into the general question of carburetted water gas supply has been abandoned as quite unnecessary, is certainly news. This is so rare a feature

of presidential addresses, that the case deserves recognition apart from the specific interest of the communication. The remaining technical business of the meeting consisted of the reading and discussion of a paper by Mr. Dunn on the automatic regulation of exhausters.

The Engineering Trade Dispute.

In discussing last week the condition of the engineering trade at home and abroad, we remarked that the fact of foreign competition and its causes would have to be faced by those who are responsible for precipitating the present crisis. The American engineering industry is making headway fast, for reasons which were recently given in "The Times." An attempt to answer this statement has been made by Mr. John Burns in a two-column letter to that paper. He begins by observing, with characteristic modesty, that he has been "so busy helping the locked-out "engineers," that he has not had time to reply to some of the statements of the employers' case that have appeared in print. The line must be drawn somewhere, however, even by so "busy" a man as himself; and he accordingly intimates that he really cannot stand the American employer's impudence. He writes a deal of rigmarole, carefully evading the hard places in the statement of which he complains, and genially admitting that "where American "engineering excels British is not because of the short-"comings of the British mechanic, but it is because of the "wooden-headed, often pig-headed character of employers "and of managers and foremen." This is handsomely turning the tables. Nowhere does this apologist face the question of who is to control the workshops, or what effect eight hours a day of the "Union stroke" is likely to have upon the British engineering industry. Instead, he concludes his ineffective effusion with the rhetorical assertion that "the greatest enemy to the future of Britain's "safety at home and abroad is traditionless, impersonal, "uncultured capital, defying the law, grinding the faces "of the poor, militarizing industry, and by mere money "and coercion overriding the inclinations of the best em-"ployers, and resisting the human and moderate desires "of labour." This is the "Ercles' vein;" but it will not advance matters. Meanwhile, the vaunt of the A.S.E. officials that they are receiving material aid from the funds of other Trade Societies is discounted by the fact that most of this money comes from levies ordered with difficulty and paid with reluctance.

An instructive commentary on the "psychological" side of the eight-hour movement is supplied by the action of the London firm of Joseph Richmond and Co., Limited, who, after having conceded the eight-hour day three months ago, on the demand of their men, have gone back to the 54-hour week. Of course, this meant a strike of all the old hands; but the firm are constrained to withdraw the concession in order to save themselves. A great deal of the work in these shops is of a special description, and such as the firm are constantly reproducing. It is consequently an easy matter to make up the cost prices; and the firm find that "the work has cost far and away "more than the difference in wages paid between a 48-hour "and a 54-hour week." Like other employers who have given way to the demands of the A.S.E., the firm were rewarded by bad service and the imposition of ever fresh vexations and restrictions. So they have decided to have no more of it.

A wise letter exposing Mr. John Burns's airy nothings has been written by Mr. James Annand in "The Times" for the 29th ult. To him Mr. John Burns and Mr. Geo. N. Barnes have replied in their customary manner. These combative personages are quite willing to fight so long as the A.S.E. has a shot in the locker; and they declare their cause is bound to win. But the employers say nothing, which is a bad sign for the rebels. The President of the Board of Trade has seen Mr. Barnes; and the Duke of Norfolk, Cardinal Vaughan, and many other notables, are understood to be not unwilling to pose, if asked, as saviours of the British engineering industry. The only difficulty is that they are not very likely to be asked. The employers have the emergency well in hand, and are bound to see it through upon the indicated lines, if it takes all the winter to do it. The longer the campaign, the heavier the indemnity that will be exacted from the losers. This sounds very dreadful to the amiable philanthropists who would like to see the more numerous army prevail over the other; but it is the way of the world.

WATER AND SANITARY AFFAIRS.

The lamentable outbreak of typhoid fever from which a portion of the town of Maidstone is suffering, demonstrates the importance of sanitary precautions calculated to prevent the pollution of water appropriated for drinking purposes. After all that has been said as to the peril of taking water from a river, it is somewhat remarkable that in the present instance the supply was not of that nature. The water which has caused above thirteen hundred cases of fever in about three weeks, and produced more than fifty deaths, was not derived from the Medway, but from springs intercepted on their way to the river. Two of these sources were situated at Tutsham. In one instance the water was taken at its very beginning; and in the other it was derived from a pool into which the springs discharged themselves. But it would appear that neither in the one instance nor the other was proper care taken to protect the water from pollution. The question is not one of sewage any more than in the fatal affair of the Caterham well. An encampment of hop pickers, destitute of any artificial arrangements, effectually poisoned the water. The mischief ought to have been promptly detected; but it was not, for the simple reason that, through ill-judged economy, the Town Council had decided to have the water tested quarterly instead of fortnightly. This unfortunate change to the longer period was made as far back as 1890, by the Local Board then in existence; but it has since been perpetuated. Now that the plague has claimed its victims, it is found—according to an interim report from the medical authorities—that the water in question contains matter calculated to produce typhoid fever, of which, indeed, there can be no practical doubt, according to the physiological test. So far as the Water Company are concerned, it has been stated by the Chairman that it was their practice to have the water analyzed whenever fresh springs were added to the supply, from which it is to be inferred that their practice went no farther.

The unhappy experience or Maidstone need excite no alarm in London. The water supply of the Metropolis is under a very different system of protection from that which exists in the Kentish town, if, indeed, the latter can be said to have any protection at all in respect to at least one portion of its supply. London has its water tested every month, and on several days in the month, by Sir E. Frankland, on behalf of the Local Government Board. The examination is both chemical and bacteriological. A similar examination is conducted daily by Sir William Crookes and Professor Dewar, on behalf of the Companies deriving their supplies from the Thames and the Lea. In a single month these Chemists report the results of their bacteriological examinations of 265 samples, supplemental to which are 53 samples taken at special points, connected with stand-pipes, wells, and other adjuncts. So vigilant is the oversight thus exercised, that directly the Companies' Chemists detect any falling off in the high standard of purity to which they are accustomed, they communicate at once with the parties in charge of the supply. In such cases a marked improvement speedily follows, due to some increased efficiency in the filter-beds. A watch is thus kept, not merely once in three months, but every day in the year. Dr. Percy Frankland attends specially to the deep wells of the Kent Company, though this part of the supply is also investigated by Sir E. Frankland. The condition of the entire Metropolitan Water Supply is likewise reported upon monthly by Major-General Scott, as the Water Examiner appointed under the Metropolis Water Act of 1871. This triple guard renders it impossible for anything to go in the least degree wrong with the London Water Supply without its instant detection. The chalk wells at Maidstone have not spread any contagion among the inhabitants. But in London the chalk wells are looked after as carefully as any other sources of supply. It is stated that the Maidstone Company have not always made use of their filter-beds. We may be quite sure that Major-General Scott will allow no such omission on the part of any London Company; and if by any chance he overlooked such an incident, the results would at once be apparent to the Analysts.

Strict supervision of the supply is a guarantee for the security of the consumer. But especially is it satisfactory to find the Companies themselves taking the initiative in those measures which tend to protect the public health.

The County Council may blame them for increasing the capital account, somewhat as the economists at Maidstone quarrelled with the expenditure of £40 per annum for the local analyses. But the issues at stake justify the outlay. Mr. Walter Hunter, the Engineer of the Grand Junction Company, publicly mentioned some little time ago that his Company were spending £100,000 in improving their storage and filtration works; and he very properly appealed to this fact as showing that the London Water Companies were earnestly desirous of doing their duty to the public, for this enormous expenditure would not add sixpence to the Company's revenue.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 752.)

THE week just closed opened with extreme quiet on the Stock Exchange; the settlement occupying the chief attention, while the Jewish holiday produced a paucity of attendance. Still the general tendency was very steady. Gradually, as the settlement was got through, much greater activity prevailed; and, aided by several cheering factors, prices took a markedly favourable course. This lasted right through to the very finish; and pretty well everything closed firm. Money was in good demand, both for settlement and in response to the usual requirements at the end of the quarter. But the supply was more than amply sufficient; and the market is easy enough. Transactions in Gas showed a large falling off in point of volume from what might have been expected after the previous week's doings, and also considering the general reawakening from the autumn slumber. On no one day of the week was there anything like a moderate amount of business. However, the dearth seemed to a large extent to be attributable to a scarcity of stock, and what came into the market commanded good prices. In Gaslights, the "A" was quiet but steady; and the prices showed a slight disposition to harden. A very few transactions were marked in the secured issues; and prices were middling without showing any tendency either way. The few transactions recorded in South Metropolitan gave no indication of any approaching change. Commercials had a slight rise after the issue of the accounts for the first half of the year, which show a considerable increase in the Company's business, though they have, of course, been much handicapped by the low prices obtained for residual products. The Suburban and Provincial group were a little more lively, and full of strength. Tottenham had a considerable rise, but not more than it deserved; and Brentford had a more moderate advance. The Continental Companies were quiet. Union had a rise in both issues, and European was steady; but Imperial looked like falling a little weaker. Among the rest, Oriental, Belgrano, and Cape Town debenture moved up in value. The Water Companies were much more active than in the preceding week; and prices were good all round. Several ordinary stocks had a moderate advance; and the debenture stocks quoted *ex div.* at the end of the quarter gained by the change.

The daily operations were: The Gas Market was almost inanimate on Monday; and nothing occurred to note. Tuesday was very nearly as quiet; and the only incident was a deal in Tottenham new at 210, which sent the quotation up 15; and ditto, old, 5. Business continued to be of the most meagre proportions on Wednesday; but both Continental Union issues went up 2. In Water, New River and Southwark advanced 1 each. Thursday, too was a quiet day, but prices still rose. Brentford new improved 2; and Oriental and Belgrano, ½ each. In Water, East London gained 3; and Kent, 1. Business was more brisk on Friday; but the only move was a rise of ½ in Cape Town debenture. On Saturday, there was a lull again. Commercial old rose 2; and ditto, new, 1.

ELECTRIC LIGHTING MEMORANDA.

An Electrical Disturbance at Glasgow—A Conflict of Interest—The Lord Provost's Suggestion—Alleged Past Blunders of the Electricity Committee.

RECENT proceedings of the Corporation of Glasgow in regard to the electricity supply of the city exhibit this model Municipality in a different light from that which radiates from ex-Lord Provost Bell's monograph noticed in the "JOURNAL" not long since. The Glasgow bailies and town councillors are doubtless mirrors of public spirit and moulds of enterprise in local self government; but they are still human, and can quarrel among themselves very naturally at times. This is something to be thankful for. Glasgow has been held up to the admiration of the civilized world for so many things, that there has been some risk of jealous people of other places turning from the survey of its excellencies with the suspicion that the population of so wonderful a city must be a distinct breed. Hence the spectacle of the good Glasgow bailies and town councillors "nagging" at one another over a question of electricity supply and tramway working is distinctly refreshing. The circumstance, also, that Glasgow does not quite know what to do in this matter is consolatory to other local authorities similarly situated.

The difficulty may be briefly summarized as follows: The Corporation of Glasgow have decided to try electric traction upon one of the numerous city tramway routes. Thereupon the question arose of who should generate and supply the electricity required—the Tramways Committee themselves or the Electricity Committee. Both Committees wanted to do it, for reasons of their own to which it was easy to impart a show of public policy. The General Manager of the Tramways appears to be a rather strong personage; and he reported uncompromisingly in favour of his department generating what electricity might be wanted, at their own price. He argued that wherever current for traction purposes had been taken from the Electric Lighting Department, the result had been neither satisfactory nor profitable. The suggestion was, obviously, that the department could only have one motive in seeking to keep the supply of electricity for traction purposes in their own hands, and that was to make a profit out of it. As against this proposal, the tramway interest lay in getting the electricity supply as cheaply as possible; and the management thought this end could be secured only by doing the work themselves. Obviously there is a good deal of reason in both views. On the one hand, it is a plausible argument that the business of an Electricity Supply Committee should be to supply electricity; from which it seems to follow naturally that where such a Committee exists in a town, all the business there is in this line should be given to it. On the other hand, it is clear that a traction service has no real connection whatever with an electric lighting service. If the former is of any importance at all, it is a much bigger thing than lighting, as was made evident in the Bristol case; and for no reason that can be regarded as valid should the greater service be bound to the less.

With a view to cut the knot of the difficulty and restore harmony to the distracted Corporation, the Lord Provost of Glasgow proposed that the two departments of the tramways and electric lighting should be amalgamated. This suggestion has not been adopted. It was well meant; but it failed to command acceptance by a minority of one vote. Honestly, it is difficult to see how it would have mended matters—the real question lying between the character of the two services, not between two Committees. Which interest should be paramount—that of the lighting undertaking or that of the tramway service? The adoption of the Provost's plan would have left this issue to be fought out in the Amalgamated Committee, which it is to be feared would hardly have been a united one. A curious muddle was the immediate result of the voting upon the Lord Provost's proposal. It came before the Town Council as an amendment to a motion for the approval of the minute of the Electricity Committee, which affirmed that the proposal was inexpedient, and declared that the production and supply of electricity by the Corporation, for all purposes, should be under the exclusive control and direction of the Committee. By accepting this motion, the Town Council appeared to approve of both its points. A question as to this was very properly raised at the next meeting of the Corporation, when it was pointed out that the Council could not adopt the latter half of the motion in view of their having resolved two months ago that the Tramways Committee should do their own electrical work. The assembled bailies and town councillors were greatly exercised on the point. But the Lord Provost ruled that the only question decided by the vote was that of his own proposal; and this ruling, of course, prevailed. The Tramways Committee and the Electricity Committee are thus to go on their several and independent ways.

This being settled, Dr. Colquhoun proceeded to call the Electricity Committee to account for several alleged shortcomings. He declared that "those who knew the inner history of the electricity enterprise were aware that in its early stages, notwithstanding the wise counsels of Professor Kennedy, their Consulting Engineer, a series of very serious blunders was committed in connection with machinery and plant to provide the city with electric lighting. These matters did not come before the Town Council, because it would not have been convenient for the Council to be made aware of the blunders that were committed and of the expense that was incurred in connection with the service of an apprenticeship by the members of the Electricity Committee." Of course, this impeachment was roundly contradicted. The present Electricity Committee claim to know their own business; and eventually their minutes were approved of by the Council. These contemplate the purchase of two additional sites for generating stations, by which the low-tension system of supply favoured by the Committee will be extended all over the city. The distinction between high and low tension is much less than was formerly the rule. The new Glasgow stations are to work up to 500 or 700 volts, which would certainly at one time have been regarded as verging upon high tension.

Hislop's Regenerative Retort-Settings.—The Morpeth Gaslight Company, in view of the satisfaction which has been afforded them by the working of Hislop's regenerative retort-settings, have resolved to extend the system in their works.

GAS ACTS FOR 1897.

(*Concluded from p. 676.*)

The following Corporation Acts refer to gas supply:—

The Dundee Corporation Act sanctions an additional gas loan of £150,000, repayable in 50 years. The sinking fund is to be formed by a 1½ per cent. charge. Gas-pipes and services on private property are to be laid "at the sight and to the reasonable satisfaction of the engineer and manager of the Gas Commissioners." The rate of interest allowable on consumers' deposits is reduced to 3 per cent. The Town Council may form an insurance fund against fire, and also against loss caused by defaulting officers of the Corporation. One-half of the costs of the Act is chargeable to the gas undertaking.

The Edinburgh Corporation Act contains a part relating to the transfer of the Portobello Gas-Works to the Edinburgh and Leith Corporations Gas Commissioners. The agreement for transfer is scheduled and confirmed. The date of transfer is Nov. 11, 1896. The Portobello gas annuities are redeemable, as from the year 1916, at 25 years' purchase. Under a special clause, occupiers who sublet their houses furnished for any period not exceeding two months can be called upon to pay the Commissioners the amount of rates and charges for gas due from the sub-tenant.

The Huddersfield Corporation Act authorizes the acquisition of additional gas lands and the extension of the gas-works of the Corporation. Gas-fittings in new buildings are to be subject to inspection by the officers of the Corporation; and in the event of their being disapproved of, the Corporation are not bound to supply gas to the premises. An appeal lies to two Justices sitting in Petty Sessions within seven days. The testing-place prescribed by the Act of 1876 is to be removed from its present position in Leeds Road to a site on the works. The sum of £16,516 is to be borrowed for the purchase of the additional lands, repayable in 50 years.

The Kingston-upon-Hull Corporation Act schedules and confirms an agreement for the transfer of the undertaking of the old Gas Company to the Corporation, subject to the approval of the Local Government Board. Power is given to pull down and remove the old gas-works and dispose of the site; the supply of gas to the district being provided for by contract with the British Gaslight Company, Limited, or the Sutton, Southcoates, and Drypool Gas Company, or either of them. The agreement for the transfer contains a provision for the protection of the Manager and Accountant of the old Company.

The Leicester Corporation Act extends the limits of gas supply, subject to the customary provision for the sale of outlying portions of the undertaking to other sanitary authorities. The formation of a Corporation Thrift Fund is authorized, under conditions set out at length. The sum of £250,000 is to be borrowed for general gas purposes, repayable in 30 years.

The Llandudno Urban District Council Act contains a clause permitting the Council to make bye-laws for regulating interior gas-fittings.

The Perth Harbour City Improvements and Gas Act authorizes the taking of additional gas lands by the Commissioners. Power is given for the supply of gas for special purposes, and for hiring out gas-fittings. The illuminating power of the gas is altered to 20 candles. The Commissioners are authorized to borrow £50,000 additional gas capital. The application of the gas revenue is prescribed, without reference to any surplus. A new contingency and depreciation of works fund is to be created by an appropriation of £500 a year. The Commissioners are authorized to contribute £1500 towards the cost of a new Tay Bridge, and £1000 towards the cost of a new road to be made by the Burgh Commissioners.

The Salford Corporation Act contains a part relating to gas. It consists of clauses for the protection and benefit of the District Council of Swinton and Pendlebury, the Corporation of Eccles, and the District Council of Worsley. For the first-named beneficiaries, it is enacted that from and after Sept. 29, 1897, "the price at which gas shall be sold by the Corporation to all persons, whether large or small consumers, who shall consume the same by meter, shall never be higher in the district than it is for the time being in the borough; and the price to be charged by the Corporation and to be paid by the Council to them for all gas supplied to the public lamps in the district shall never be higher than the price for the time being charged by the Corporation to private consumers in the district." A testing-station may be provided by the Council within the district, to be afterwards maintained at the joint expense of the Corporation and the Council. The illuminating power of the gas at this place is to be 17 candles, tested by the Salford burner, under a £20 penalty for default. For the protection of Eccles, it is enacted that "the Salford Corporation shall not at any time charge consumers of gas within the borough of Eccles a higher price than that charged by the Salford Corporation to consumers of gas within the borough of Salford under like circumstances, and shall at all times give to the consumers of gas within the borough of Eccles the same discounts and rebates as shall be given to consumers of gas within the borough of Salford under like circumstances." Gas of 17-candle power is also to be supplied to Eccles, tested locally. In the Worsley district, the price of gas is not to exceed 2d. per 1000 cubic feet more than that charged in Salford; and the district is to have the advantage of the Swinton and Pendlebury testing-station. The sum of £85,000 may be borrowed for gas purposes, repayable in 30 years.

The Swansea Improvements and Tramways Act relates chiefly to the working of the town tramways by electrical power; it therefore contains a set of provisions for the protection of the Swansea Gas Company.

A COMPARISON BETWEEN ENGLISH AND FRENCH PRACTICE IN GAS PHOTOMETRY.

We have received a copy of a valuable little work prepared by Mr. A. J. van Eyndhoven, Chief Chemist and Gas Examiner to the Imperial Continental Gas Association at Amsterdam, with the object of collating English and French practice in the photometry of illuminating gas. The book is in English, and should be in the hands of all gas managers who are so situated as to be subject to both English and French methods of testing for illuminating power. This is actually the case at some of the stations of the Imperial Continental Gas Association and the European Gas Company; and apart from this particular application of Mr. van Eyndhoven's work, it is always interesting to be able to compare the gas tests of different countries with one another. The author observes that the testing of gas for sulphur compounds other than sulphuretted hydrogen is not customary in Paris and other French and Belgian towns, "and in all these places we very seldom hear of any complaint in connection with the impurity of the gas." The main purpose of the book, however, is not the discussion of the extent to which gas should be tested for impurities; but to set out the comparison between the English and French methods of determining the illuminating power of the gas, with regard to the instruments used for the purpose in both countries. The author observes that to his knowledge this has never been done. "In London a French photometer is never used, and in Paris no testing-station possesses an English one." Consequently, he does not believe that anybody really knows what the illuminating power (say) of Paris gas is, when measured by the English standard. When the Dutch Gas Managers' Association report on photometry was prepared, it was only possible to arrive at a comparison of the English and French systems by indirect means. Since then Mr. Eyndhoven has become possessed of a standard French photometer made by Brunt and Co., of Paris, which he has been able to employ concurrently with a 60-inch Sugg-Letheby instrument.

The difference between the English and French methods of gas photometry is more than a matter of instruments. The former depends upon the use of a gas-flame of constant consumption, which gives a light of variable intensity. In the latter, the intensity of the light is maintained constantly equal to that of the standard (the carcel lamp, stated by the author as being equal to 9·631 candles), and it is the rate of consumption of gas which varies. Mr. Eyndhoven shrinks from saying which is the better system. The English method has the demerit of depending too much upon the candles used as a standard of light. The carcel is declared to be a better standard than the candle, being less variable. On the other hand, the English standard burner is a better one for the purpose than the French Bengel burner. As for the photometers, Mr. Eyndhoven ventures to prefer the French make and pattern. There is too much wood about the English instrument to please him. Generally speaking, he thinks the French method of determining the illuminating power of gas more reliable than the English one. It is also quicker and more convenient. It is complained that the English photometer is so made as to be only capable of use in one way—that is, with the lights always at the same ends. This would not matter if the eyes of the observer were always equal. As a fact, however, few people's eyes are exactly alike; so that it is desirable to have facilities for reading a photometer from either side of the scale. The French photometer obviates this difficulty by bringing both the lights to bear upon the one side of the screen, which is observed from the other side.

Without giving further excerpts from Mr. Eyndhoven's work, which contains many hints of value to the conscientious photometrist, it may be stated that he makes normal Paris gas (105 litres to the carcel) equivalent to an illuminating power, ascertained by the English method, of 13¼ candles. This, therefore, is the figure that must be understood whenever the brilliant gas lighting of the City of Paris is in question. Mr. Eyndhoven's book, which contains many tables and appendices, is published by Mr. H. Gerlings, of Amsterdam, and Messrs. Spon, of London.

Proposed Changes in the Mode of Testing Gas in London.—The "Notification" which the Metropolitan Gas Referees have just issued from their new office, 66, Victoria Street, S.W., for the coming winter, contains, in addition to the usual intimation as to the maximum quantity of sulphur (22 grains per 100 cubic feet) permissible in the gas supplied in the Metropolis during that season, a notice of the intention of the Referees to "make extensive changes in the mode of testing the illuminating power of gas, and to establish uniformity in this matter in all the testing-places." The intended changes are to be set forth in another "Notification," which will be issued as soon as possible.

THE ACCOUNTS OF THE METROPOLITAN WATER COMPANIES FOR THE PAST YEAR.

THE usual Parliamentary Return which has just been issued, showing the accounts of the Metropolitan Water Companies for the past year, is likely to gain more than ordinary attention at the present time, from the fact that the financial position of the Companies forms part of the question which has been referred to the Royal Commission on the London Water Supply. Though some of the accounts terminate in September last year, while the others run to the close of the year, the whole may be taken as showing the state of affairs for 1896. Some of the figures, if viewed superficially, may easily mislead, and may admit of being turned to party purposes in the struggle which goes on at Spring Gardens. The increasing prosperity of the London Water Companies which appears by comparing the present return with its immediate predecessor, will excite still further the fiscal ambition which already affects the Progressive party. The net water-rental shows an increase of £64,000; having risen from £2,003,150 to £2,067,206. The net profits exhibit a yet more extensive rise; having gone up from £832,000 nearly to £950,000. How this increase of almost £118,000 has been brought about partly appears by a decrease of £44,000 in the charges for maintenance and management. Adding this to the increase in the water-rental, we get a total of £108,000.

A point will very likely be made of the circumstance that the increased revenue has been accompanied by a diminution in the volume of water delivered. But the aggregate of the supply simply varies according to the demand. The consumers have what they require, be it more or less; and their demands are governed by circumstances over which the Companies have no control. There is another factor to be considered, and that is the question of waste. It may be hoped that the diminished consumption of water last year was caused in some measure by the adoption of effectual means to produce a decrease in the reckless waste which has been too commonly practised. But this is not the first time there has been a diminution in the aggregate of the water supply. In 1894, it fell off by nearly 701,000 gallons per day; in 1888, there was a decrease of above 1,376,000 gallons per day; and in 1882, of 8,273,000 gallons. In 1895, there was an extraordinary increase in the daily consumption, to the extent of 22,654,000 gallons. It was obvious that this admitted of curtailment. The total supply to the Metropolis was as much as 212 million gallons per day. Last year a more moderate rate was observed; the daily quantity being 198 millions. These are round numbers, and they show a decrease of 14 million gallons per day, for 1896. But if we go back to 1892, we find a population of about 280,000 less than that of last year, having a supply below that of 1896 by as much as 18,300,000 gallons per day. In 1892, the daily supply was not quite 34 gallons per head. Last year, notwithstanding the reduction, there would be at least 35 gallons per head. Such increased profits as the Companies may have earned are not due to any rise in the charge for water, but to the growth of the population and the consequent multiplication of houses, coupled with the exercise of that "due care and economy" which joint-stock companies are naturally induced to exercise, and in which they are often found to differ from bodies which are in a position to make good deficiencies by a levy on ratepayers.

In respect to the figures quoted above, we have depended mainly on the parliamentary returns. In a short time we shall have the benefit of Mr. Lass's masterly "Analysis," when all the details of the subject will be made clear. At present we can only give a broad outline, and for a period which comes no later than December last, whereas the particulars given by Mr. Lass will, according to the usual plan, extend to March. It happens that this difference in the periods has the effect of making the revenue of the Companies, as given by Mr. Lass, somewhat higher for 1895 than is shown by the parliamentary returns; thereby lessening the apparent advance made in 1896. There remains one thing concerning which some further elucidation seems to be required than that at which we are yet able to arrive. We allude to the discrepancy which appears in General Scott's figures respecting the magnitude of the water supply, as published in the annual reports of the Local Government Board, when compared with those recorded by the Registrar-General in his weekly reports, and in his "Annual Summary." The difference, somewhat important, happens to be especially so just now. Thus the Registrar-General shows a decline of more than 16-million gallons, instead of about 14 millions in the daily water supply of the Metropolis during 1896, as compared with 1895. But this is connected with the circumstance that the same authority shows a daily supply for 1895 which is more than 7 million gallons in advance of the quantity recorded by General Scott. The truth is that every month, and therefore every year, the Registrar-General is giving much higher figures for the Metropolitan Water Supply than those published by General Scott. The daily supply for last June, according to the latter authority, was 211,346,941 gallons; while the former reports 215,752,965 gallons. On looking into the tables, it is found that the difference, amounting to 4,406,024 gallons, is due to a larger amount credited to the East London and Kent Companies than that which is allowed by General Scott. With respect to all the other Companies, the two reports are in agreement. We find a similar state of things in July, and we presume in all the months. The explanation—at least in part—is furnished by a foot-note, easily overlooked, given in General Scott's monthly report, where it is stated that, in respect to the supply, the Kent Company return the gross quantity calculated from the volume of the pumps; "but a deduction of 7 per cent. for 'slip' or short stroke has been made for the purpose of this report." Reducing the Registrar-General's figures for this Company by 7 per cent., we get the quantity recorded by General Scott. But the case has not been put so clearly with regard to the East London Company, who are classed with the other Companies whose returns are sent in with a reduction already made. What the reduction is we are not told; but we find that if we take the Registrar-General's figures respecting the East London Company, and reduce them by 7 per cent., we get the amount which appears in General Scott's report. We do not say that this kind of reckoning entirely accounts for the annual difference in the figures—in fact, we cannot conceive that it does, though it goes some way towards it. But it is much to be desired that the two authorities should be agreed in their statistics, as sundry million gallons per day, more or less, is an appreciable quantity. We may observe that the figures employed by Mr. Lass agree with those given by General Scott.

OBITUARY.

We regret to record the death, on Sunday, the 26th ult., of Mr. ALLAN BROWN, the Manager of the Chigwell, Woodford, and Loughton Gas Company. Deceased had held his position for about thirty years, during which time he conducted the affairs of the Company very successfully; bringing the undertaking from a non-dividend paying to a highly flourishing condition. Before going to Chigwell, he was engaged in the management of the gas and water works at Portsmouth. Deceased, who was in his 58th year, leaves two daughters and a son. The funeral took place last Wednesday at Ilford Cemetery, and was attended by a large number of personal friends and neighbours; Mr. Brown having gained great respect in the district by his many acts of kindness.

PERSONAL.

Mr. W. TAPLAY, foreman at the Plympton Gas-Works, has been entrusted with the managership.

Mr. J. C. BELTON, of Willenhall, has secured the appointment of Engineer and Manager of the Redhill Gas-Works, advertised in the "JOURNAL" in July last under No. 2884.

Mr. H. TAVERNER, of Macclesfield, has been selected to fill the position of Superintendent at the Shipley Gas-Works—an appointment which was advertised in the "JOURNAL" for Aug. 24 under No. 2902.

Mr. F. A. NIVEN, second son of Mr. G. H. Niven, of Cleckheaton, has been appointed Working Manager of the Rowley Regis and Blackheath Gas Company, for which position applications were invited in the "JOURNAL" for the 7th ult.

It may be remembered that the managership of the Briton Ferry Gas-Works, vacant by the resignation of Mr. W. Cheyne, was conferred upon Mr. Lea, who, however, was unable to accept the appointment. It has now, we learn, been conferred on Mr. J. MOGFORD.

The Directors of the Guildford Gas Company have presented their Chairman, Mr. MARK SMALLPEICE, on his retirement, with a handsome gold-mounted Malacca walking-stick, bearing a suitable inscription, in testimony of their appreciation of the able and courteous way in which he always conducted the Board meetings.

The value of the personal estate of the late Mr. GEORGE GRIPPER, of Tottenham, has been declared at £60,313 gross and £60,117 net. The income arising from the shares held by deceased in the Tottenham and Edmonton Gas Company, of which he was Chairman, has been bequeathed to his widow, as trustee for his two daughters.

In honour of the completion by Alderman PETRIE of his twentieth year as Chairman of the Gas Committee of the Rochdale Corporation, his colleagues on the Committee recently entertained him to dinner. Alderman Petrie has been a member of the Town Council for a quarter of a century; and the selection of him, after only five years' experience of Corporation work, for the important position he now fills, was a gratifying testimony of the confidence placed in him—a confidence which has been abundantly justified.

Mr. T. BERRIDGE, Assistant-Manager at the Litchurch works of the Derby Gas Company, left those works on the 30th ult. to take the position of Secretary and Manager to the Leamington Gas Company; and the officers and workmen presented him with a salver and pair of candlesticks in silver, as a mark of their esteem. The presentation was made by Mr. C. Taylor, the Engineer and Manager. In the course of his address, he said he had known Mr. Berridge for about a quarter of a century, and he had been with him officially for about twenty-one years. From the outset, Mr. Berridge had shown very worthy qualities;

and he (Mr. Taylor) had never, during the whole course of his connection with him, had serious occasion to disapprove. Mr. Berridge had gone on energetically and faithfully, and had from time to time had his position deservedly advanced in the service of the Company. He was sorry, on behalf of the staff and himself, to lose him; but he was at the same time glad he had accepted a post at Leamington which would no doubt prove congenial, and would enable him to exhibit his abilities for the benefit of that Company. He felt sure the Directors had made a wise choice in appointing Mr. Berridge, and would not regret it. Three hearty cheers having been given for Mr. Berridge, he expressed his thanks for the presents. He said he was pleased to hear that throughout his time of service with the Derby Gas Company he had received the approval of all his superiors. So far as had lain in his power, he had endeavoured to act uprightly as regards both masters and men. Mr. and Miss Taylor were then thanked for attending. The Secretary (Mr. R. Fisher) was unable to be present owing to illness, but the company included Mr. Berridge's successor (Mr. Rowland Fisher) and many other officers and workmen to the number of about 150.

NOTES.

Lecomte and Loeser Low-Pressure Incandescent Burners.

The marvellous development of incandescent gas lighting which has taken place during the past few years has necessarily given an impetus to the inventive powers of burner makers; and the result, as our "Register of Patents" testifies, has been the production of many new appliances suitable for use with this system. A great point is, of course, to prolong the life of the mantle; and it is thought by some that this end may be secured by a judicious regulation of the pressure at which the gas reaches the point of combustion. The above-named burner, which was briefly described in the "JOURNAL" for the 29th of June, has been specially designed for use with low-pressure gas. It consists of an ejector, having one central hole of conical shape forming an angle of about 30° with two converging cones arranged one above the other, and having different angles; the lower cone having an angle about equal to that at which the gas expands, and the upper one preferably from seven to nine times greater. The burner usually works at a pressure of 6-10ths to 7-10ths; but, if necessary, 4-10ths will suffice. Economy is claimed for the burner when used with any kind of mantle for incandescent lighting. The results of tests made with it, in comparison with an ordinary Welsbach, are given in the last number of "Le Gaz," and it may not be without interest to reproduce them. A Welsbach burner having a 3-inch mantle and a 10-inch chimney, and consuming 4·3 cubic feet of gas per hour at a pressure of 27-10ths, gave a light of 72 candles; whereas a Lecomte burner with a similar mantle and an 8-inch chimney yielded the same amount of light with a consumption of about 3·2 cubic feet of gas per hour—showing a saving to the extent of 26 per cent. Using a 10-inch chimney, and burning the gas at a pressure of 7-10ths, 4·3 cubic feet of gas per hour gave a light of 92 candles—an increase of 27 per cent. Another experiment with the Lecomte burner, used with a 2½-inch mantle and an 8-inch chimney, gave with a consumption of 3 cubic feet of gas per hour a light of 50 candles—showing an economy of 25 per cent. as compared with the burner against which it was tested. It is claimed for the Lecomte burner that it is very considerably cheaper than the ordinary batswing or argand, or the incandescent electric lamp; while it compares very favourably with a recuperative or an acetylene burner, as well as with the arc lamp.

Moissan on the Electric Furnace.

M. Henri Moissan, as already mentioned in the "JOURNAL," has published a book upon the electric furnace, describing the apparatus, and recounting his own experiences in its use. From an appreciative notice of this work in the "Electrician," we learn that the author devotes a chapter to the formation of carbides, silicides, and borides. It is remarked by our contemporary that "the undoubted priority which M. Moissan possesses in the discovery of calcium carbide is stated in a manner as temperate as it is conclusive. We hope to have heard the last of the nonsense that has been said and written about prior American discoveries, and concerning the valuable patents which can be based on them. Patents, no doubt, there may be for particular apparatus; but a patent for the manufacture of calcium carbide by the use of the electric furnace, though, no doubt, conducive to the revenue of the country granting it, is of no other negotiable value." This is a confirmation of the opinion on the same subject expressed in the editorial columns of the "JOURNAL" for the 21st ult. M. Moissan's study of carbides has led him to a theory of the origin of petroleum. This is that some at least of the known and utilized deposits of petroleum may have been derived from the action of water on carbides under high pressure and at an elevated temperature. M. Moissan does not hold it necessary to assume the same origin for all petroleum deposits, inasmuch as various reactions produce stable hydrocarbons as the ultimate product.

Action at a Distance.

The interesting problem of "action at a distance" has been discussed by Herr P. Drude, who gives the latest scientific view of the subject. It is not easy to define exactly what action at a distance is; but it may be understood as the production of a change of state in a body by something which occurs to another body not in contact or connected with it in any way. Where there is contact, this may act either through an elastic solid, or by impact, or by transmission through a compressible or incompressible fluid. Thus the phenomena of electricity and magnetism have been reduced to events in the luminiferous ether; but gravitation remains as an unexplained action at a distance, chiefly owing to the fact that no propagation of gravitational energy in time has yet been proved. Since what we call the the attraction of gravitation, unlike luminous or electro-magnetic vibrations, cannot be suddenly brought into play or annulled, the proof of a time propagation is difficult to furnish. Yet Laplace actually calculated a minimum value for the propagation of the gravitational force from the "aberration" due to the motion of the moon. It came out as 10 million times the velocity of light. This value, as Archdeacon Wilson remarked at Nottingham last week, is unthinkable. As regards the nature of the force itself, apart from its propagation, Drude admits that the only theories which are even half-way satisfactory are those based upon the impact of very minute particles, as assumed by Le Sage, Kelvin, and Preston.

The Light of the Electric Arc.

Discussing the phenomenon of the electric arc in the "Electrician," Mr. T. Hesketh refers to the culmination of Humphry Davy's experiments in 1802 with the production of the carbon arc, which was the first recorded transformation of electrical energy into light. From that time to this, he declares, the state of affairs has been practically unaltered; and the great range of possibilities lying latent in the arc have been left undiscovered. Two things alone seem to have been appreciated by the world of patentees—the necessity of a better and harder charcoal for the composition of the pencils, and an efficient means of feeding them together as they are consumed. Of the unexplained phenomena, none have received so much study as has been given to the incandescent electric lamp, and essentially the arc lamp of to-day is in almost the same state of undeveloped originality as it was ninety years ago. This backwardness is not the fault of the arc itself. Mr. Hesketh points out that while the superior efficiency of the arc as compared with the incandescent electric light is universally conceded, against this advantage is opposed the difficulty of producing, by the arc lamp, light of sufficiently small volume to give good distribution effects. He thinks it a mistake to make the traditional 2000-candle power the standard of arc lamps; and he states that manufacturers are turning their attention to the production of small arc lamps which will be suitable for interior lighting. It is a question, however, how efficient these will be as compared with the larger lamps. According to present practice, a full-sized arc lamp, taking carbons of 18 and 12 millimetres diameter for positive and negative respectively, will, if these are a good quality, have a mean lower hemispherical illuminating power of from 1200 to 1500 candles. This would mean a consumption of 10 ampères direct current, with carbon E. M. F. of about 44 volts. Of this light, Mr. Hesketh admits that a sacrifice of at least 60 per cent. must be made for diffusion; "so that the illumination we may expect from a nominally 2000-candle power lamp is more like 500 than that ascribed to it. If one estimates the useful light to be equal to 1 candle power per watt consumed, the work done by the average lamp will not be much under estimation." Mr. Hesketh has experimented upon the employment of smaller negative carbons, with the object of increasing the illuminating power of the lamp; but he finds that the increased effect thus obtainable is not of practical utility for all lighting purposes.

An Electrical Recorder for Water-Meters.—The authorities of the Chicago Water Department have been endeavouring to secure a device that will prevent the theft of water from the city mains by manufacturers who it is alleged tamper with the meters and draw water through the bye-passes. Mr. A. Prussing has patented an electrical appliance for this purpose, which will allow the dials of meters all over the city to be kept in a single room in the City Hall, where they can be watched, and where the ringing of an electric bell will give notice of any attempt to tamper with the meters of factories. Mr. Prussing claims that the cost of the control system will be small, as already there are plenty of wires to all parts of the city, and the authorities have the right to use the conduits and poles of several companies.

The Spontaneous Combustion of Coal.—A Royal Commission appointed in New South Wales to inquire into the cause of the dangers to which vessels carrying coal are said to be peculiarly liable, have lately made their report. The Commission went thoroughly into the matter; and they give a general explanation of the theory of spontaneous heating. As to the depth at which coal should be stacked, some interesting data were obtained from Mr. T. J. Bush, the Engineer of the Australian Gas Company, who found that in one store, where the depth was 14 feet, there was no tendency to fire; but in another store, with 20-feet depth, great care had to be taken. This agrees with M. Fayol, a French investigator, who put the safest depth at from 6 to 7 feet. The Commissioners disagree with the theory that the oxidation of pyrites may be the initial cause of spontaneous heating; though by breaking up the coal when wet, it increases the surface, and therefore the tendency to fire.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Scarborough.

The members of the North of England Gas Managers' Association had their forty-first half-yearly meeting in Scarborough last Saturday. The meeting was held in the Grand Hotel, in a magnificent apartment overlooking the charming South Bay of the celebrated watering place. There was a very large attendance. Mr. J. HOLLIDAY, of Scarborough, the President, took the chair at mid-day, and introduced the Mayor of Scarborough, Mr. R. A. Marillier, who gave the Association a

WELCOME TO THE TOWN.

The MAYOR said it afforded him very great pleasure to see the members all there that day; and he wished them, in the name of the town, a hearty welcome to their beautiful home. Those of them who had been there before knew the advantages the town possessed, and that it well deserved the name of "The Queen of Watering Places." Those who had not been there before, he hoped would remain long enough to find out for themselves the attractions of the place. They possessed a good bracing air, and a good climate; they had an ample supply of good water, also a good drainage system; and the town was very well lighted, both by gas and electricity. Those who had already visited the gas-works would have found that they were not surpassed by many in the kingdom. So far as he saw of them, they seemed to him to be everything that was required, and to be exceedingly well arranged for the supply of gas to a town like Scarborough. Before the members left the place, he hoped they would be able to see, under the able guidance of Mr. Holliday, the many attractions of the neighbourhood.

Mr. BENJAMIN FOWLER, the Chairman of the Gas Company, cordially endorsed the welcome which had been given by the Mayor. The Gas Company were, he said, very much indebted to the gas managers for the trouble they took in connection with these meetings. They were all aware that people would have good gas; and they were therefore obliged to give it them good. They were, consequently, very greatly indebted to their engineers and managers for being able to supply them with good gas. The members had come to Scarborough for a few hours; and though the business to be transacted might be rather dry to some of the visitors, he had no doubt it would not be so to the members themselves. He hoped that after their business they might be able to see something of Scarborough. It was always a beautiful place; and he cordially welcomed them to it, in the name of the Gas Company.

The PRESIDENT said that, in the name of the Association, he must convey their best thanks to his Worship, the Mayor, and to the Chairman of the Gas Company, for the kind welcome which they had given to the Association. He thought it would help to give them, perhaps, a little encouragement in their work. He did not know that they required any help in the ordinary way; but the welcome they had received would doubtless give them a little more heart in their several spheres of labour.

NEW MEMBER.

Mr. Arthur Clement Hovey, Assistant Manager at the South Shields Gas-Works, was elected a member of the Association.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following address:—

Gentlemen,—My first duty is to express on behalf of the Association the deep regret with which we as a body recently learned of the removal by death of one of our Past-Presidents. Mr. Vitruvius Wyatt was, I believe, in early life connected with both the Stephensons on railway works—more closely I understand, however, with Mr. Robert Stephenson on the bridge across the Menai Straits. During his busy and varied career, he was for some time Constructing Engineer to the Gaslight and Coke Company, of London, and also acted as Consulting Engineer to the Newcastle and Gateshead and the York Gas Companies. His Presidential Address to this Association during his year of office, on "The Structural Capacity and Cost of Gas-Works," is of too recent date, and too well known, to require further reference.

In connection with the inner life of the Association, I may take this opportunity of reminding members that the first formal meeting was held in South Shields in April, 1877. In April of next year, therefore, the Association will attain its "majority."

Before proceeding further, I must take this opportunity of thanking you for the honour you have conferred upon me by electing me President of your Association for the current year; and I sincerely trust that the proceedings may be worthy of the record of the Association, and further that pleasant vistas of your visit to Scarborough—of which I may say we are all very proud—may arise before your eyes in the future, when the tenor of your minds is "contemplative."

An apologetic introduction is always apt to savour to some extent of unreality, and naturally invites a criticism—viz., that what requires an apology need never be attempted. Yet it is difficult, and especially so for a young President, to say anything upon a serious subject without some expression of his sense of its inadequacy. I will merely say, therefore, that the following remarks make no special claim to originality; they are simply an attempt to arrange and summarize what has probably already been done with greater amplitude and fuller authority elsewhere. Call it a *pot pourri*, if you will, in which no one ingredient is particularly conspicuous.

Some two decades ago, the mind of the public, especially that portion of the public interested in gas stocks as an investment, was much perturbed by the possible effect of a new illuminant—electricity—upon the coal gas industry. Reference to the newspaper files of that period ensure, in the light of present day events or facts, some most interesting reading. The following extracts from the "JOURNAL OF GAS LIGHTING" for May 8, 1877, are perhaps worth re-producing to-day:—

> The day so anxiously expected by those who, not having a penny invested in a gas undertaking, regard with envy every farthing of profit made by a gas company, and that feared by those who object to the acquisition of gas undertakings on the ground that gas is likely to be superseded by some other means of illumination, is drawing nigh. Electricity it has constantly been said is the force that will generate the light of the future.

After criticizing the then condition of appliances for electric lighting, the writer of the article wisely concludes:—

> In the meantime, we hope that no gas proprietor will be beguiled into selling his shares. Gas still has, we believe, "a long day." It will last our time.

The faith of the writer of these latter words has been more than justified. Gas still survives; and its future is as bright—even brighter than it was when the words were penned.

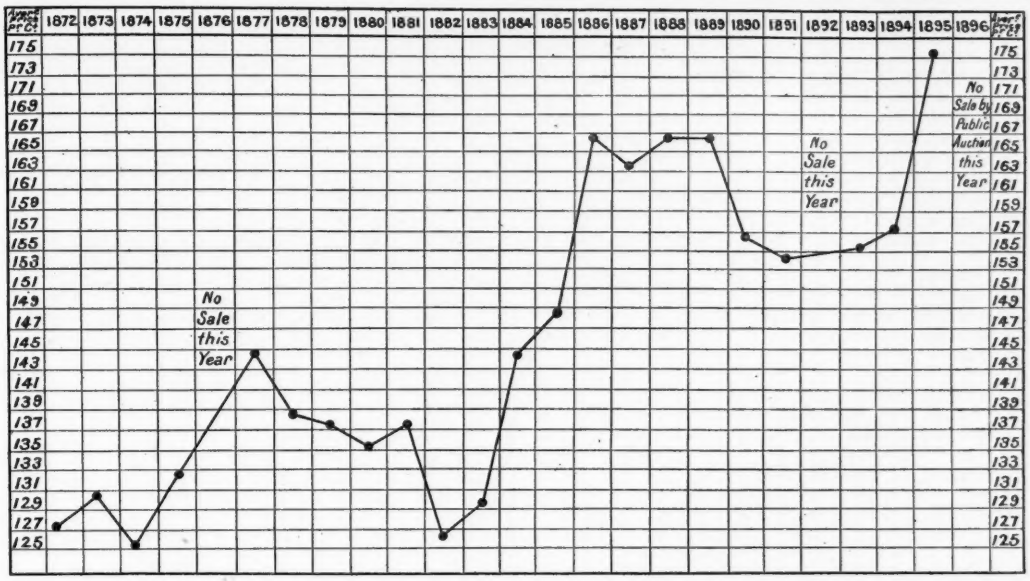
I daresay there are those present who have a clear recollection of the introduction of the Jablockoff "candle" into this country, and the spirit of despondency among many people who were interested financially in gas undertakings. In this connection, I was much amused by a sketch I happened to be looking at a few days ago entitled "Recollections of a Record Reign," by Frank Paton, wherein under the date "1877" appears a figure labelled "Gas," making a precipitous exodus outside the range of the rays of a "Jablockoff candle." Much of the dust that was then raised has now happily been laid; and gas stock in a well-managed concern to-day ranks practically as a first-class investment.

I have had a diagram prepared showing the rise and fall in the average annual price per cent. of a 7½ per cent. ordinary stock in a Provincial Gas Company for the 25 years 1872-96, during which period full statutory dividends have been paid. The first big fall in market values, you will observe, was due to the general electric lighting "scare" referred to; and the second, to the advent of a local electric lighting company. This was, however, of comparatively short duration; and to-day, judging by the latest sale by public auction (in the year 1895) gas has again been favoured with full public confidence, as the purchaser was apparently perfectly satisfied with the annual interest realized—viz., about 4⅛ per cent., which does not leave a considerable margin for "risk" on an ordinary stock.

I think I may say, without much fear of being accused of drawing wrong conclusions, that as a matter of fact, so far from the gas industry suffering from the introduction of the electric light, it has received just the fillip necessary to make it assert itself and branch out into pastures new. Winsor predicted long years ago that gas would eventually supersede coal for heating and cooking purposes, as it would obviate the pollution of the atmosphere with smoke, and dispense with chimney sweepers, "for whom a more Christianlike employment would be found." It is highly improbable, however, that even Winsor, with all his foresight, ever dared to dream that so much of our commercial industry would depend to the extent it already does upon a constant supply of coal gas.

Much has been achieved; but the development of that department of gas enterprise classed as "other than for lighting purposes" is practically only in its initial stages. And in these days of keen competition and survival of the fittest, it behoves all of us connected with the industry to watch closely for possible improvements, and adopt them without delay if they are proved to be of sufficient intrinsic value. Englishmen are, as a rule, somewhat conservative and cautious of swallowing every "blessing" conferred upon them; but yet when once the benefits are clearly demonstrated, they are just as eager to adopt as they before were to depreciate them. Therefore it is incumbent upon us, as members of an industry the total invested capital of which in this country follows, I believe, that invested in railways, to seize every opportunity of meeting the requirements of the public as quickly and successfully as possible, and so, beyond achieving a present success, confer a lasting benefit on the succeeding generation. The position we ought to strive to occupy is: Supposing the practical application of electricity for all general lighting purposes to be only a question of a few days—which it certainly is *not*—we could even regard it occupying its *Ultima Thule* with a quiet mind.

Electricity for lighting purposes has undoubtedly made great strides within the last ten years, and keeps moving forward; but it has not yet checked the increase in the consumption of gas, so far as I know, where the two have been in competition for any length of time. Indeed, taking Scarborough as an example, the tendency has been for the demand for gas to grow more



rapidly than it did before the introduction of its rival. Many of the cleverest men of the day are engaged upon the problem of the further development of electricity. But there is room enough for both; and when its problem is successfully solved—as solved no doubt it eventually will be—let us take care not to let the position still remain Gas *versus* Electricity, as it largely is at present, but Gas *and* Electricity.

The rapid growth of towns has in recent years caused a great demand for many engineering specialities. The use of gas for engines, in cooking, and for many industrial and mechanical purposes, has caused an entirely new feature in the working of many concerns—*i.e.*, a heavy day consumption; and I have no doubt in the course of time we may reach what I hope I am not in error in terming the Eldorada of a gas manager's mind so far as output is concerned, a level load throughout the 24 hours, or at least over a much greater proportion of the 24 hours than has been experienced in the past. The following figures recording the day consumption for the ten hours from 9 a.m. to 7 p.m. in Scarborough, show very fairly the proportion of gas consumed in the town for cooking, heating, motive, and other industrial purposes:—

Scarborough Day Record.

Date.	Total Consumption for 24 hours.	Consumption between the Hours of 9 a.m. & 7 p.m.	Percentage on Total Consumption.	Average Temperature in Shade.	Hour of Sunset.
1897.	Cubic Feet.	Cubic Feet.		Deg. Fahr.	
July 25	595,600	282,500	47	66	7'56
„ 26	465,800	222,100	47	68	7'54
„ 27	574,600	252,900	44	69	7'53
„ 28	601,000	306,500	51	65	7'52
„ 29	586,000	267,100	45	70	7'50
„ 30	577,200	254,700	44	69	7'49
„ 31	605,400	288,700	47	60	7'48
Aug. 1	701,100	269,800	38	60	7'47
„ 2	625,800	285,400	45	67	7'45
„ 3	672,200	283,600	42	75	7'44
„ 4	651,800	309,100	47	73	7'42
„ 5	681,500	308,300	45	70	7'40
„ 6	677,100	313,400	46	73	7'38
„ 7	720,600	298,200	41	70	7'37

The average percentage on the total consumption between these hours for the 14 days recorded being, in round numbers, 45 per cent.—a result upon which, I think, we may fairly congratulate ourselves.

There is one other point in connection with the increasing demand for gas I might mention here, and that is the change which is taking place in the conditions of social life in this country. The steady immigration from the rural districts into our towns, and the developments effected upon most individuals after experience of town life, certainly point to the fact that the average Briton is becoming a more cultured, and perhaps more fastidious, personage than the generation preceding him. What place on the social pedestal may be ultimately assigned to gas, I am unable to prophesy; but I am certain that, among the many other benefits enjoyed by humanity, the better lighting of our streets and houses must have had a considerable influence for good upon the social conditions of the people. "Light, more light" wrote Goethe; and the higher the social life of the masses, the greater will the tendency for more light undoubtedly be. In order to live up to, or keep pace with, this development we, as the responsible agents, ought to be moving with it in our own sphere. The chief point at present is to supply a good article at the lowest possible cost, to suit the types of burners most generally in use. For future progress, however, we require to be looking rather further ahead. There are many fields of chemical science in which it does not make much difference, if the work which is waiting to be done shall wait a little longer—a decade more or less is of no great importance. But here delay is fatal. I am, of course, speaking now entirely upon the question of gas as an illuminant. There is no disguising the fact that, under present conditions, electricity has supplanted it in many cases; and I frankly admit it is not to be wondered at. What we want to do in the future is to be in a position to offer to the public some reliable medium for consuming the product we supply, which will compete closely upon all points of efficiency in application with electricity, and at a price which will render competition on values to all intents and purposes impossible.

Great strides have been made in this direction, especially through the ingenuity of Dr. Auer von Welsbach with his incandescent mantle; but there is still much to be done to get a burner which will meet the views of the consumers as a body. It appears to me that what we really require is a medium capable of resisting a greater amount of wear and tear than the mantles at present on the market—that is to say, something approaching the hardiness and durability of an ordinary flat-flame or argand burner at least, and one which will develop high luminous effects with a low standard of gas. If such a burner could be placed upon the market at a very low figure, and its use become universal, the amount of money which could be saved in most cases by supplying a gas of lower illuminating power, would enable us to charge such a price for the gas as would render its position, even as an *illuminant*, almost unassailable.

And now let us turn to rather a different side of the industry—I mean the practical everyday life on our works. It is a matter at all times of deep personal interest to me to quietly note the light in which the manufacture of illuminating gas is regarded in the lay mind. The general feeling, so far as I have been able to observe, is that it is purely a mechanical operation, and will in the ordinary course of working regulate itself—or, in other words, the raw material, when once passed into the retorts, is finished with to all intents and purposes until the gas has passed into the holder, and the coke is ready to be drawn out of the retorts again; no trained or technical supervision being necessary. This rule-of-thumb supervision is certainly successful up to a certain point, when it generally becomes necessary to pay for it. I was very much struck with some remarks I noticed a little time ago in this connection, to the effect that if the same amount of skilled attention and technical knowledge had been devoted to the manufacture of gas as has been to the successful development of electricity as an illuminating medium and for other purposes, the gas industry of to-day, in place of simply awakening to the possibilities of the future, would have occupied an impregnable position.

When we come to consider the composition of crude coal gas as it leaves the retorts, carefully observe its chemical constituents, and note that certain of them can be of no assistance to either its illuminating or its calorific value—rather detrimental—but that, skilfully extracted and dealt with on scientific commercial lines, they have a certain value attached to them in the market, and yet are allowed to go forward, I fancy all will agree with me that we are still in the rear of the ground we might have occupied. One reason for this is, I believe, that sufficient encouragement has not been offered to induce the type of men who are capable of dealing with such issues to undertake the work.

In order to get good working results—and upon these depend, together, of course, with the cost and quality of the raw material, the price and quality at which we shall be able to

supply our product—there are many points to be observed. We must have plant and apparatus adapted for its special work, and of good construction—that is, of such construction as will enable it to perform its function in the most efficient manner at the lowest possible cost. Many forms of apparatus in use are in certain conditions, so far as efficiency is concerned, practically useless. Take as an instance the work of an atmospheric condenser in the ordinary way. So far as I understand the idea of the erector, it is designed for the purpose of reducing the temperature of the crude gas after leaving the retort-house *gradually* from a comparatively high point to the temperature most suitable chemically to be dealt with by the scrubbers or washers. What do we find as a rule? Very often this section of apparatus is placed in an exposed position. In summer, the rays of the sun so counterbalance the work of condensation, that the gas passes away at a temperature totally unsuited for undergoing the next step of its treatment. The following table of temperatures recorded upon such a type of condenser may be of interest:—

Date.	Time.	Condenser Temperatures in Degrees Fahrenheit.				Temperature in Shade in Deg. Fahr.
		Inlet.	Right.	Left.	Outlet.	
July 23	6 a.m.	125	95	80	65	61
	9 a.m.	125	100	90	75	63
	12 noon.	125	105	90	75	65
	3 p.m.	125	105	90	80	65
	6 p.m.	125	105	85	82	66
	9 p.m.	125	95	85	70	62
	Midnight.	120	90	80	60	60
July 24	3 a.m.	122	90	82	63	61
	6 a.m.	125	100	90	75	66
	9 a.m.	125	100	90	80	73
	12 noon.	130	110	105	85	72
	3 p.m.	125	105	95	80	74
	6 p.m.	130	102	92	76	71
	9 p.m.	130	95	82	72	65
	Midnight.	125	93	82	63	60

You will notice that the minimum temperature recorded at the outlet is 60° Fahr. at 12 o'clock midnight on the 23rd of July; and the high figure of 85° Fahr. was attained at 12 o'clock noon the following day, with an inlet temperature of 130° Fahr. and temperature in the shade of 72° Fahr. Then, to take the other side, in keen winter months nearly the whole of the work is done by the first two or three tubes, with the natural effect that, owing to the sudden deposition of the tar and hydrocarbons, the illuminating value of the gas is depreciated. The form must be defective, because it cannot do its work efficiently, and our working results suffer; but yet it appears to flourish exceedingly. Laying down water condensers, with proper arrangements for neutralizing the outside or atmospheric temperature, whether it be in hot summer or cold winter, with the aid of thermometers at the necessary points, and supplies of hot and cold water attached, and passing our gas forward all the year round at the temperature which will enable the next process—the washing—to deal with the gas most perfectly and efficiently, would be a much better policy. When a doctor is called in to deal with a case of high temperature—fever—his first endeavour is to bring it down to the normal. If it is a case of low temperature—say, from exposure—his first efforts are to raise it to the normal. The effect of too high or too low temperatures upon coal gas at the point under consideration is, in its way, for after-effects quite as detrimental as upon the human frame. I am merely taking the foregoing as one instance, and a typical one, although a fair budget could very easily be compiled.

Then we have the question of the execution of as much of the transport of material, &c., by mechanical means as possible. Many economies can be effected in this way. Time may be saved, work more efficiently carried out, cost of appliances, tools, barrows, &c., lessened, and, lastly, more perfect control effected by the introduction of well-designed automatic transport appliances. How necessary this is becoming in the present condition of the labour market—particularly the engineering trades—you are all aware, as well as what has been gained by it. The labour troubles of this country are simply forcing the hands of the producer—not in gas manufacture alone, by any means—to safeguard his interest as much as possible. It is not difficult to foresee that the time is not far distant when in the large works manual labour will be reduced to a very small compass indeed. The conveyor from the coal-store to the inclined retort, and from the inclined retort to the coke-store, is already an accomplished and a growing fact; and it is upon such facts as these that we have to build our business of the future—economy in production, and efficiency of the finished product.

Let us follow the idea rather further. On our various works there are numberless details coming under the head of "economies" which it might perhaps be worth spending a short time in considering. For instance, the ordinary method of dealing with our exhaust steam is to allow it to go "puffing and barking away" into the atmosphere, as a writer aptly described it in one of our technical magazines a short time ago. There is a tendency now-a-days, however, to introduce condensers of the "central" type into the more advanced engineering works, especially among the Germans. A large central condenser is used to maintain a vacuum, into which all the various engines, pumps, &c., discharge their exhaust steam. This is the extreme development of the separate condenser idea of Watt, and is the logical outcome of the evolution of his original invention. When such a type of condenser is of good construction, it effects much saving in the amount of fuel used and in the cost of cleaning the boiler, as all lime, oil, &c., is retained in the condenser. Where, as is the case in many works, a hard water has to be used for the boilers, this is a point worthy of careful consideration. It is rather surprising that so little has hitherto been attempted in this way. The advantages of its adoption are so very obvious. As was shown in the "Engineer" recently—

> The gain to be had by condensing to a fair vacuum is very considerable, particularly with triple expansion engines. The gain to be had by taking the pressure of the atmosphere off the low-pressure cylinder is so great that it is well worth buying at a considerable price. Let us take, for instance, a low-pressure cylinder, 30 inches in diameter and 24 inches stroke, making 300 strokes per minute. The piston speed is 600 feet per minute, and the area of the piston 706 square inches. Thus each pound of effective pressure on the piston represents 13-horse power nearly; and a vacuum in the cylinder of but 20 inches would represent 130 indicated horse power gained, besides the great saving which might in many cases be effected in the cost of feed-water.

Of course, the above figures apply to a type of engine perhaps not generally found on smaller gas-works at any rate. But the principle is precisely the same; and there is no doubt that the introduction of a good form of condenser is a step which ought to receive careful consideration from all steam-engine users.

Then with belt-driven exhausters, or in other cases where shafting is being used, much depends upon its proper alignment. The whole trouble with line-shafting is that too many incompetent people think they know how to fit it up. In truth, however, a line-shaft is a comparatively delicate piece of machinery; and its making, erection, and maintenance all require good engineering sense. With this, its friction ought to fall far below that which many experiments have shown to exist. It is, perhaps, not incorrect to even describe the average line-shaft as a "wriggling, squirming body," trying hard to preserve a straight line against the evil efforts of uneven bearings and injudiciously placed driving-pulleys. Shafting honestly made and intelligently put up and cared for, can give a good account of itself. That these are matters of no very great importance individually, I at once admit; but if taken collectively they amount to the saving of larger sums of money at the end of the year than is generally supposed to be the case.

In the early part of this address, I referred to the possibility of securing higher values for residual and prospective residual products. Sulphate of ammonia is, as we are all aware, in a parlous plight at the present time. But somehow I think the ammonia in our gas might be put to other uses, if the problem was resolutely tackled. In these matters, we in the gas profession have a slight tendency perhaps to sit down at an awkward time, and wait for some outsider to come in to help us over the style. Not that it matters much who does the work, so long as it is done. Over-production is, I suppose, a large factor in the present condition of the sulphate market; and whether in the future the prospects of this market will be any brighter than they are at present, it is difficult to foresee. The annual production of sulphate of ammonia in the United Kingdom is, in round numbers, 170,000 tons, of which some 120,000 tons are made from gas liquor; the remainder coming from shale-works, iron-works, &c. The question of the encouragement of a local demand in this country has received considerable attention already, and has been so far successful; but not to the extent necessary to meet the increasing yearly production. We must therefore, I suppose, work out some other means of meeting it.

The recovery of cyanogen compounds has suggested itself favourably of late to some minds; and I think we shall see it develop itself considerably within the next few years. The exact forms in which cyanogen exists in crude coal gas are a little uncertain—that is, they vary somewhat according to circumstances. In some cases, it is said to be in the form of cyanide and sulphocyanide of ammonia; while other observers say that it is present as cyanogen or hydrocyanic acid. The form in which it really is present is not a crucial point in this connection, as there does not appear to be any difference of opinion as to the correct method of recovery—viz., by treating the gas after it leaves the scrubbers or washers with an alkaline solution of precipitated oxide of iron; the cyanogen forming a ferrocyanide of the alkali. This ferrocyanide is easily converted into potassium cyanide, for which there is a large demand for purposes of recovering gold. Millions of ounces of gold have been recovered from "tailings"—material which had formerly to be regarded as waste—by the introduction of the cyanide process into the Transvaal alone. The present price of commercial potassium cyanide might, of course, fall somewhat if larger quantities of the material were put upon the market; but even so, we should certainly be receiving a return for a product which at present is mostly allowed to waste, and for which we are receiving nothing. This would help to balance to some degree the present loss on revenue account through the weak position of the sulphate of ammonia market.

In the tar market affairs are fairly satisfactory. The Germans, of course, show us a clean pair of heels in its utilization, as usual. During the twelve months ending June, 1896, Germany sent to the United States 9,763,080 lbs. of alizarin,

against 308,743 lbs. despatched from this country; while of coal tar colours and dyes, the imports from Germany were valued at $2,324,157, and those from Great Britain at $191,263. Striking figures, and not very creditable to English energy, considering that a great amount of the tar from which these products were manufactured saw light in English gas-works. What is the secret of it all? I think it will be found based greatly on the fact that the Germans employ large staffs of highly-trained and highly-paid chemists, who spend their time on novelties and on the improvement of existing products. Scarcely a week passes but they offer something new. Taking the returns of three German Companies for last year, we find that Messrs. Fredrich Beyer and Co., of Elberfeld, made a profit of £266,800, and paid a dividend of 18 per cent.; the Badische Anilin und Soda Fabrik, of Ludwigshaven-on-the-Rhine, had a profit of £400,938, and distributed 26 per cent.; and Messrs. Meister Lucius and Bruning, of Hochst-am-Maine, came out with £341,555 to the good, and were enabled to return 28 per cent. In other words, they know their business thoroughly; and the sooner we begin to follow their lead in these matters, the better it will be for the future of the coal gas and cognate industries.

I suppose some reference to one of the latest additions to our family circle will be expected. I mean carburetted water gas. Much has already been written and said on the policy of its admission as a factor in English gas supply; and much misconception exists, even among presumably well-informed writers in the Technical Press, as to what carburetted water gas really is. As a matter of fact, it is altogether a different product from what it is generally supposed to be. If we deprived ordinary coal gas of its luminosity and odour, we should have a product with physical properties similar to simple water gas. But carburetted water gas is an altogether different matter. Its odour—and that is our chief safeguard against accidents with coal gas—is even more pungent, and will make its presence more manifest than will coal gas. When used as an auxiliary to coal gas, as is the practice generally, no circumstances can possibly arise which can make its use detrimental to the consumer. I think we may take it for granted that the gas industry, as an industry with capital at stake, and with competition to contend with, is not quite so short-sighted and imprudent as to introduce anything which could possibly, upon clear proof, cause the value of its product to depreciate. Carburetted water gas has come to stay; and as time goes on it will come to be regarded as at least as useful and necessary an adjunct to a gas-works as a reserve stock of coal is at the present time. The step recently contemplated by the Local Government Board, of appointing a Departmental Committee in order to consider the whole question, has, I understand, been abandoned as quite unnecessary.

Before concluding, allow me to refer to one or two other present-day issues. The Chancellor of the Exchequer in his last Budget made some interesting remarks upon the Coinage; and among other things, he stated that 32 million copper coins had been struck during the year, and 245 tons of copper had been used in the work, which is three times the value of the preceding year. Not a little of this increase was attributed to the various penny-in-the-slot machines in use. So far as we—that is, the Scarborough Gas Company—are concerned, I am afraid our contribution towards this immense figure is of infinitesimal degree. It may not be uninteresting, however, if I state that during the twelve months ending June 30, 1897, the number of coins collected from the penny-in-the-slot gas-meters in use within the borough was 216,000, weighing approximately 38½ cwt. That the penny-in-the-slot system will continue to grow as rapidly in the future as has been the case in the past, I am rather dubious; but that the principle of prepayment—say, with shilling-in-the-slot or other silver coins—has a great future before it, cannot be doubted.

Gas for motive purposes has also a great field for development ahead, particularly for private electric lighting installations. The working charges, interest costs, &c., of such installations allow so great a margin between the price per unit necessary to be paid to public electric lighting companies, that no business firm, having the figures we are able to submit placed before them, will hesitate for one instant, if they have decided that electricity is the lighting medium that is most likely to meet their requirements.

And now having regard to the short time at our disposal to-day, I must bring my remarks to a close; and in so doing, I can only reiterate the words of prophecy before quoted: "Gas still has a long day. It will last our time."

Mr. Matthew Dunn, of Selby, read the following paper:—

THE AUTOMATIC REGULATION OF THE SPEED OF EXHAUSTERS.

There are few matters of greater importance to gas engineers than that of ensuring a constant and equal exhaust, without which there is an excessive deposit of carbon upon the sides of the retorts, occasioning a corresponding deterioration in the quality of the gas. It is therefore felt that little excuse is required for bringing the subject of this paper before you to-day; the advantage of any appliance proved to automatically regulate the speed of exhausters when driven either by gas or steam engines being universally acknowledged. The utility of such an apparatus must be apparent to all members of the gas profession, and especially to those engineers at whose works the exhausters are driven by means of gas-engines.

Before proceeding to describe the apparatus, it may be advisable to refer to a paragraph in an excellent paper entitled "The Modern Gas-Engine: Its Development and Applications," prepared by Mr. G. E. Stevenson, and read before the members of the Incorporated Institution of Gas Engineers at their meeting held in May, 1895. Mr. Stevenson, with admirable lucidity, described the gas-engine from its introduction; and in one of the concluding paragraphs, he said:—

> Much may be done by the owners of gas-works to encourage the use of gas-engines by employing them for their own purposes. It is at present the exception rather than the rule to find them used in gas-works. In small works, the principal thing for which power is required is driving the exhauster; but in few instances are gas-engines used for that purpose—one reason being that variations of speed are difficult to provide for. It might be worth inquiry whether some convenient appliance could not be devised for varying the speed of the exhauster, while that of the engine remained constant.

Mr. Stevenson afterwards stated, in his reply on the discussion which followed, that he had seen exhausters driven by gas-engines; and in every case it had been necessary to bye-pass the gas to some extent, in order to maintain equilibrium, and to meet variations in the make of gas. The perusal of this paper led the author to experiment, in conjunction with a colleague, with the view of finding a solution of the problem. For this purpose, models were prepared and many experiments made; but it was not until March of this year that the peculiar conditions required were actually fulfilled.

Early in May last, a full size apparatus was fixed to an exhauster at the Selby Gas-Works, which has continued "automatically regulating the speed" from that time down to the present day, according to the variations in the make of gas and the fluctuations in the speed of the engine—and this without the usual bye-passing. The exhauster is alternately driven by means of a gas and a steam engine; and in both cases the apparatus acts with perfect regularity, and maintains a steady gauge throughout, as indicated by the eleven pressure diagrams shown.

[The author here exhibited a series of eleven diagrams. Diagram No. 1 showed the working with the gas-engine taken immediately after the apparatus was fixed; No. 2 was an indication of the working with the steam-engine, taken at about the same time, but after sundry alterations had been made, principally with the object of reducing friction at the several working parts. He explained that much improvement had been effected, as diagrams Nos. 3 and 4 proved; the former with a gas-engine, and the latter with steam driving.]

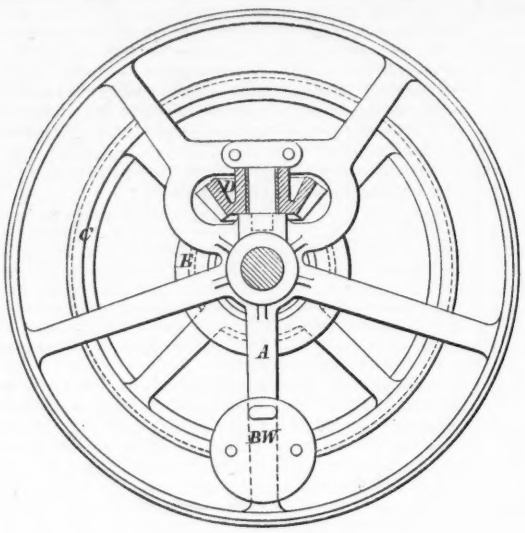
At present, the only way, apart from bye-passing, of regulating the speed of exhausters with any degree of success, is by attaching a governor to a throttle or equilibrium valve, which regulates the steam supply to the engine. This system does not appear to be altogether satisfactory for the following reasons:—

1.—No matter how sensitive the action of the equilibrium or throttle valve, it is still dealing with expansive steam. Even though the valve be shut off entirely, the live steam contained in the pipes, cylinder, and ports will expand and continue to exert a certain amount of power upon the engine, impeding the desired rapid reduction of speed.

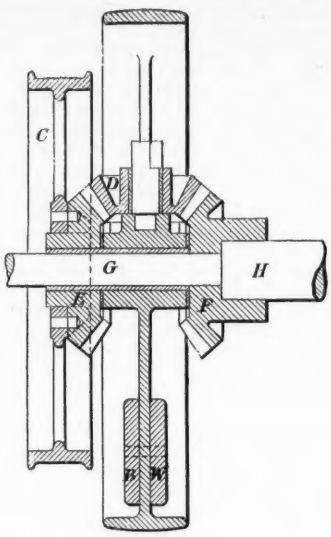
2.—In a large works, the engine may often be used to drive two exhausters in winter, when both are required; while in mid-summer only one will be necessary, and that probably running slow. In such circumstances, the governing arrangement that will suit the former set of conditions will not do for the latter, and will be difficult of re-adjustment. It is almost impossible to proportion the size of an engine in a gas-works to the work it has to do, on account of the fluctuating character of that work; and, as a natural consequence, it is difficult to properly govern the exhauster all the year round. For small or medium-sized works, where the engine may be required to do several other duties—such as driving pumps, rotary washers, coke-breakers, &c.—the engine is usually made larger to permit of its overtaking the extra work, which is of an intermittent character. Having regard also to the great difference between summer and winter production of gas, the possible change in the number of exhausters at work, and the variations of boiler pressure, the difficulty of obtaining a steady gauge by the steam-regulator is manifest.

[The author illustrated this point by the other diagrams of the series—taken from a steam-regulated exhauster by an engineer in the Midlands. He remarked that diagram No. 5 was very regular throughout the 24 hours, and was taken with 40 retorts in operation. No. 6 was taken with 32 retorts in action, and was fairly good, though not so regular as No. 5. No. 7 was irregular, and was taken with 24 retorts on. Nos. 8, 9, 10, and 11 were much worse, and showed the working with 16 retorts. In another instance, diagrams obtained from an important works showed variations as much as 2 inches in the pull on the retorts during charging periods—and this, too, with an engine supposed to be controlled by means of a steam-regulator. From the foregoing, and many similar cases which might be mentioned, the author thought it was evident that the steam-regulator was not universally successful.]

When we come to the gas-engine as the motive power for our



ELEVATION OF WHEEL.



SECTION.

exhausters and machinery, we have a motor the speed of which is practically constant, to drive an apparatus the speed of which is ever varying; and this, in the ordinary course, necessitates much bye-passing, which combines with the usual periodical re-arrangement of pulleys to prevent in a great measure the adoption—otherwise appropriate—of the gas-engine in a gas-works. It is suggested that the new automatic apparatus about to be described, besides supplying the necessary correcting medium in the case of gas-exhausters driven by gas-engines, is equally applicable to exhausters where steam-engines are used, and where the difficulties of obtaining a steady gauge are considerable.

When the gas-engine for driving the exhauster was adopted at Selby in 1895, it was at once realized that there were many accompanying difficulties. In order to maintain a steady gauge, much bye-passing had to be done; and more frequent attention was required than hitherto. However, by the use of the apparatus which is to be described, highly satisfactory results have been produced, and the attention needed almost reduced to *nil*—and this with what may be considered only an experimental set, temporarily fixed, and in every way too heavy and unlike the latest type.

The principle of its action can be seen from the illustration, as well as from a working model now shown. One side of the gear is connected to the motor, either directly or by a belt; and the other is connected to the exhauster. Between the two is the brake or resistance wheel, C, fixed on the boss of the wheel E; the speed of both being controlled by the governor-bell. A driving-pulley A B is provided, upon the arm of which is pivoted, in a suitable bearing, a bevel or mitre wheel D, which, it will be noticed, is in gear with the two mitre-wheels E and F fitted upon the horizontal shafts G and H. The mitre-wheel F is fixed and keyed at the end of the shaft H. Butted thereto, and loose in F, a smaller shaft is continued through the several wheels, and is supported at the end by means of a suitable bearing or pedestal. These two shafts only meet in the boss of the wheel F, and are otherwise entirely independent of each other.

A band-brake is arranged partially around the lower side of the brake-pulley C; and a brake-lever carried in a suitable bracket is connected to one end of the band-brake—the other end being carried by a fixed bracket. On the brake-lever end, a cord or wire is attached, which is carried over small guide-pulleys and fastened to the centre of the governor-bell, which, of course, rises and falls according to the pressure in the mains leading from the retorts. In this way, the variations of pressure in the retort-mains are automatically placed in direct control of the speed of the exhauster. To illustrate this, two extreme cases may be taken, in both of which the engine is kept running at the same speed. Supposing the exhauster to be not required, and standing still, the governor-bell will be down, removing all strain from the brake-lever. The wheel A B and the two pinions E and D being thus thrown loose, are merely revolving, and absorbing no more power than the loose pulley familiar to all with shop experience. On the other hand, let it be supposed the exhauster is required to run at its maximum speed. The brake-wheel will then be restrained from turning, or braked-down, by reason of its having a full load thrown upon it by the governor. It is apparent, therefore, that the brake-wheel is really a resistance wheel, and takes up the motive power otherwise used by the exhauster when that is not working, and when held or braked-down by the action of the governor conversely transfers the motive power to the exhauster. In ordinary working, the circumstances will vary between the two extremes above cited; and the apparatus can therefore work the exhauster at any speed up to the maximum rate. The rate of speed being always regulated according to the make of gas, by the governor's control of the brake-wheel, it is impossible for the exhauster to exert a greater pull on the retorts than the set amount, as the connection between the governor and the gear is regular, and the exhauster is accelerated or retarded in a direct and positive manner. The pull on the retorts can be so regulated by adding weights to the end of the brake-lever, that any required maximum pull can be fixed upon up to the maximum capacity of the gear.

Comparing the action of this apparatus with that of the bye-passing arrangement, it will be seen that the former goes to the root of the matter, and alters the speed of the exhauster according to the make of gas automatically, instead of merely churning a portion of the gas over and over again. With the bye-pass it is necessary, in order to deal with the maximum make, to run an exhauster too fast for the periods of minimum production, and allow so much to leak by. It would be interesting to know the number of revolutions in excess of actual requirements made by the average exhauster in (say) a year's working, where bye-passing is entirely relied upon. There is no doubt this would be found by no means insignificant. This excess must have an important bearing on the efficient working of the engine and exhauster, and the length of time that they will run smooth and tight; while the extra lubrication and attention required will be considerable.

Having described the working of the apparatus, the author would urge his professional brethren present to examine and test the model before them, which, will fully demonstrate all that has been said in the course of the paper with reference to the appliance and its working.

Before concluding, it may not be out of place to refer to previous attempts made in the same direction. First, reference may be made to the Fison apparatus, which consists in driving the exhauster by means of a belt running on cone-pulleys, one of which is fixed on the exhauster shaft, and the other on a countershaft or on the engine-shaft. The variation is effected by attaching the belt-fork or guide to the exhauster governor, which directs the belt up or down the cones. It need hardly be mentioned that this apparatus, on account of the power required to move the belt to-and-fro on the cones, and the tendency of belts to climb to the highest part of a pulley—resulting in belt breaking, &c.—has not met with the success anticipated. Another plan referred to by Mr. Stevenson, on the date previously mentioned, is an ingenious arrangement consisting of a disc, having a small wheel fixed, and working on the face thereof at right angles. The two work together by means of friction; the variation of speed being effected by changing the position of the small horizontal wheel from the centre to the circumference of the disc, and *vice versâ*. There may be many applications of this clever contrivance; but as yet the author is not aware that it has been adopted, or is in any way suited to the purpose.

In any apparatus for this object, it must be borne in mind that the power available for operating it is very small, from the fact that the effective power given off by the governor is little. The apparatus, however, which is being brought under your notice to-day, requires little power to operate it—no more, in fact, than that needed to work an ordinary bye-pass or steam-regulating valve. It is very sensitive to the least perceptible variation, as will be noted in the manipulation of the working model, which practically explains itself, and will save any further detailed description of its construction.

In conclusion, the following summary of the advantages of the gear may be given:—

1.—A steadier gauge can be maintained, as indicated by the pressure-register.

2.—A more uniform effect is exerted on the illuminating power of the gas.
3.—The suction on the retorts being constant, there is much less formation of carbon within.
4.—Owing to the reduction in wear and tear, the life of the exhauster is longer, and less lubrication and attention are required.
5.—The apparatus is suitable alike for gas or steam driven exhausters.
6.—One engine can drive two or more exhausters at different speeds.
7.—The exhauster can be stopped or started independently of the engine.
8.—The gear is applicable either to direct-driven or belt-driven exhausters.
9.—It furnishes a method quicker in action and more sensitive than that of governing the engine.
10.—It is simple, durable, and absolutely reliable.

Discussion.

The PRESIDENT said they had just heard read a paper which, was full of interesting and suggestive points; and he hoped that the discussion would be full and free.

Mr. DAVID TERRACE (Middlesbrough) was sure they were all indebted to Mr. Dunn for giving them so interesting a paper. There was no doubt whatever he was working in the right direction—that was to say, that an engine, to be a real engine to be used in the driving of exhausters, should run at a uniform speed, and give off its proper duty at the same time. But he (Mr. Terrace) could scarcely agree with the author in his conclusion that the apparatus would be more economical than the present means which were used, because, with Mr. Dunn's apparatus, the engine would necessarily have to run at its full speed all the time, although the exhauster would not, and the wear and tear of the engine would go on all the time. It was only in the exhauster that the wear and tear would be reduced. At the same time, he (Mr. Terrace) thought it was an admirable contrivance. He tried, while Mr. Dunn was speaking, to get at the principle of its action; but he confessed that up to the present moment he had failed to see how it acted. Perhaps Mr. Dunn would enlighten them as to what made him think of this method of arriving at the result he had achieved.

Mr. E. H. MILLARD (Durham) said that there were one or two points upon which he should like elucidation. One was as to the point where the pressures shown on the diagrams were taken, as they knew that the position made a very great difference. If they were close to the exhauster, they knew they would get considerably more variation than they would further back, nearer to the retorts. There was also the common device of checking the tap a little, so as to prevent oscillation. He should like to know how far this might apply to the diagrams. The apparatus was certainly a very ingenious adaptation. But it was nothing more nor less than the differential dynamometer applied to the speed of the engine; and it was bound to act. It was only strange that when they had the dynamometer, nobody ever saw its application to the driving of exhausters. The diagrams shown were certainly excellent. One could tell almost every retort as it was put on; and there was a considerable difference where this apparatus was employed, and where the ordinary arrangement was used. Anyone could see that. He could congratulate Mr. Dunn upon his maiden effort; and he hoped this would not be the last paper the Association would have from him.

Mr. T. BOWER (West Hartlepool) said they were all much indebted, he was sure, to Mr. Dunn for the able paper he had put before them, and for the experiments he had shown them with reference to a matter which was of very great importance to all gas managers. If the old maxim were correct, that dividends were made in the retort-house—and to his mind it was a true one—the apparatus which had been put before them, if further practice established that it would answer all that was claimed for it, would, he was sure, conduce very much to the enhancing of the dividends of gas companies. The matter of gas-exhausting was at all times rather a delicate one; and at the present time he was having an experience which, he was sure, was one which many managers had had who were in the habit of working two retort-houses with one exhauster. In the case of No. 1 house, he had a very long length of foul main; and in the case of No. 2 house, a very much shorter one. In fact, the areas of the two were almost as entirely different as the circumstances would entitle them to think of. The result was that, let them be never so careful in regulating the speed of the exhauster, they were bound to have a variation in the pressure. He mentioned this more particularly as he thought it might be information to Mr. Dunn, if it had not come under his observation before, and because, if his apparatus should be found to be suitable for such a state of matters as he (Mr. Bower) had named, it would be very readily taken up by those who had to work two retort-houses with one exhauster. The results shown in the diagrams seemed to be exceedingly even; but, of course, it would be a great factor as to the accuracy of the diagrams if the points they were taken from were given. The apparatus, looking at it on the spur of the moment, seemed to be one that there should be no difficulty whatever in getting to work directly; and as the author had described, of course, it was one of those appliances of which he could imagine they would require to have a little experience before they could speak with any amount of confidence upon it. Mr. Dunn had had more experience with it than anyone else, and naturally he might take a sanguine view of its capabilities. He had no doubt that, if further trial strengthened the points Mr. Dunn had put before them, there was a field for the apparatus, and that it would push its way into gas-works.

Mr. HERBERT LEES (Hexham) joined with the previous speakers in their thanks to Mr. Dunn for having brought the subject before them. The question of exhausting was one which was always of importance in gas-works. As Mr. Dunn proceeded with the reading of his paper, the difficulty with him (Mr. Lees) was as to where the advantage was to come in. However, before they got to the end of the paper, it was shown that the main advantage claimed was better regulation, and saving in wear and tear of the exhauster. He did not know what the latter might amount to; but he was anticipating that there would be more saving in the case of steam, because if with gas the engine was kept running at the same rate of speed, and the brake was put upon the exhauster, there would be no saving whatever. It would also have been, perhaps, a more reliable test of the apparatus if the diagrams exhibited had been taken from the same exhauster before and after the application of the apparatus. He understood that this was not done; but that the diagrams taken from the exhauster without the apparatus were from a different exhauster to the one to which the apparatus had since been applied. He was not quite sure that the practice of bye-passing was such a detrimental one. Of course, he was open to conviction upon this point, as well as upon other subjects which might be brought before them; but what was the depreciation which the gas suffered from bye-passing? Did the gas suffer in consequence; and if so, how much? There was certainly no economy in the working of the engine which Mr. Dunn had shown them; and he (Mr. Lees) failed to see any very great advantage which there would be in introducing the appliance. He thought it was quite possible to work with a bye-pass with a very little variation in the exhaust, or a vacuum; and unless there were some very clear indication that it would be a gain in some other way, it was probable that the apparatus would not be generally adopted. However, the proposal was in its initial stage. He thought that Mr. Dunn was working in the right direction; and he was quite sure that the subject was in good hands, and that if any improvement were to be effected by it, they would hear from him about it, and they would all get the benefit of his experience in the matter.

Mr. W. D. GIBB (Newcastle) said his great objection to the apparatus was that he did not see why the gas-engine was introduced at all. The steam-engine, to his mind, seemed to be a more simple and a better way of governing the speed of exhausters, which, at all times, must vary. To start with, they must have an engine which was capable of doing the maximum amount of work; and then they required an engine which could be regulated to do a less amount of work. In the steam-engine, they could easily regulate this by the amount of steam introduced, and further by expansion gear. If the gas-engine were used, then, as Mr. Lees had said, it would be running at full power throughout; but he failed to see the force of Mr. Lees' argument that, by bye-passing the gas, he saved a part of the energy expended by the engine. In his opinion, bye-passing did not save in the actual amount of energy required to move the gas. But the apparatus shown, so far as he could understand it, was certainly a most ingenious one. He was really not competent to prophecy as to its future; but they were all very much indebted to Mr. Dunn for bringing it forward. Gas exhausting was always a most interesting subject to gas managers, as well as a most fascinating one to most of them.

Mr. R. PORTER (Elland), on being invited as a visitor to express his opinion, said he was not very favourably impressed with what the commercial result of the arrangement might be. He had had some experience with gas-engines for driving exhausters. He had had five years' experience, almost to a day, with one, without having any steam-engine as an auxiliary; and he was not very favourably impressed with the idea of using gas-engines for the purpose. He did not think they were so cheap as steam-engines, because the fuel which they used in a gas-works for producing steam was of a very cheap quality, and they might even have to pay for carting it away if they did not use it for the purpose. Consequently he thought that steam was preferable for driving exhausters; and further he thought it could be more economically applied to exhausters, because they could regulate the speed of the engine as well as that of the exhauster. He did not think they would gain a very great advantage by altering the speed of the exhauster, if they could not alter the speed of the engine, and thereby conserve some of the energy required for driving it. Steam was governed, and consequently the wear and tear with it must be less.

Mr. B. B. WALLER (London) thought the apparatus which had been brought forward by Mr. Dunn showed a great deal of ingenuity. He considered it would be an excellent means of doing the work; but, as had been said, it did not affect the speed of the gas-engine. If they could regulate this, and thereby save gas, it was a point which should be studied. For the governing of steam-engines, he thought personally that a governor acting directly upon the steam-valve was what should be used. The nearer they got the source of governing to the

steam-inlet, the better governing result they obtained. As far as gas-engines were concerned, they generally only found them in connection with minor works, where a small exhauster was used. The difference between the maximum and minimum make in such works was so trifling a factor that bye-passing was of little moment. The apparatus shown was a very great step in the right direction in the matter of governing an exhauster driven by gas. He thought it was an excellent arrangement, and a great advance beyond the old regulator used for governing an exhauster that was driven by a gas-engine, and a vast improvement upon it.

Mr. H. TOBEY (Malton) said he must compliment Mr. Dunn upon the able manner in which he had laid the matter before the meeting, and especially for the working model he had shown. He thought the apparatus was much more suitable—and possibly Mr. Dunn had this in mind when he designed it—for small than for large works. As they knew, in the latter works they kept a man to attend to the exhauster; but in works of limited capacity this business had to be attended to by a stoker, who had also other occupation. In such a case, he thought that a gas-engine was admirably fitted for driving an exhauster; and any method which would enable them to regulate the speed of the exhauster should commend itself to all as being suitable for small works. He himself hardly thought the apparatus was qualified to take the place of the ordinary regulation by means of bye-passing. But it appeared to him that they had here the gas-engine, the exhauster, and the governor, the same as in an ordinary case; but they had, in addition, the gearing of the apparatus for regulating the speed of the exhauster. This gearing stopped the motion, and therefore it was liable to get out of order, and required to be attended to and kept in repair. On the other hand, in the ordinary governor and bye-pass, they had a very simple arrangement. There was little also in its first cost; and it was very efficient if they had the governor large enough. It was very easily adjusted so as to give a constant pull on the retorts; and there was very little variation with it, either up or down, on the gauge. Therefore he hardly thought the apparatus was likely to come into ordinary use. Something was said about gas-engines for driving exhausters having always to go at one speed. But the speed of these engines could be varied from 200 to perhaps 140 revolutions. This was a range within which they could be run very efficiently. In addition to this, in small works they could always make a change of wheels upon the engine. If they started an extra bed of retorts, they could put a larger wheel on the engine and a smaller one on the exhauster. It would not take a day to change the wheels; and with the change they would be able to meet the requirements of small works very satisfactorily. As he had said, they were obliged to Mr. Dunn for bringing this matter before them; but, at the same time, it did not commend itself to his mind as being any very great advance upon what they already had.

Mr. C. D. DRURY (Hendon, Sunderland) said that he agreed more or less with Mr. Gibb, that, especially in large works, there was no reason why gas should be substituted for steam, except by way of example to consumers, to induce them to take up gas-engines. In gas-works there was such a large quantity of refuse fuel that was worth using up in the way of raising steam, for which it was very cheap. They always required steam in gas-works; and therefore, except, as he had said, by way of example to those outside, he did not see any reason for substituting gas.

Mr. W. FORD (Stockton) said he had only one question to ask, and that was whether Mr. Dunn worked his retorts on Sundays; and if he did not, whether he found that the machine was of use in lowering the whole of his retorts for non-Sunday duty.

Mr. DUNN, in closing the discussion, said that Mr. Terrace had asked him how he first obtained the notion of this apparatus. Well, he might cause a smile, but he got the idea first of all from an old tricycle. If they examined the gear-box of an old tricycle they would see very much of the idea. Mr. Millard asked at what point he took the pressure. It was taken within 6 feet of the inlet to the exhauster; and at this place he thought they got as fair a test as possible.

Mr. MILLARD: What is the length of your foul main?

Mr. DUNN said it was about 120 feet. As regarded the doctoring of the taps, he might say they were all of ordinary type, clean, and of full size. With reference to Mr. Bower's case in point, he did not know how he would apply his apparatus, but he desired specially to show them that it could be applied to steam-engines equally as well as to gas-engines, as the indicator diagrams would show. There seemed to be a mistaken idea with reference to the subject of wear and tear on the engine. He could demonstrate to anyone present that with the apparatus he could release the brake or brake the speed down, but it did not take the load off the engine. It varied the speed of the exhauster, and it would do this with a steam-engine as well as with a gas-engine. He had tested it, because he knew it was one of the points which would be raised; and he found that, when they took the brake off, when they took the load off, they put it upon the apparatus to act, and there were fewer explosions. If they put more work on a gas-engine, and found that the explosions became more frequent, this apparatus would take hold of it. That also answered Mr. Porter's query. They must not mistake him; he was not there to advocate the adoption of the gas-engine in all cases. He adopted the gas-engine more for convenience than anything else. He had at one time a steam-engine, which had been built "in the time of Adam;" it was subject to fits, and he wanted something which he could rush to and set to work at once, because he had only limited storage and could not allow the exhauster to stand a minute. He pitched upon a gas-engine as a remedy; and he had never seen any disadvantage in using such an engine. Nay, at all times, he used it in preference to steam; but when he wanted steam, he would put it on for a week or so, and thereby use up all his refuse ashes and the like. But the gearing was not, and was not intended to be, applicable to gas solely, but was brought into use to get himself out of a difficulty, because he found out that there had been an extraordinary amount of bye-passing going on. The gas-engine required very little attention. Indeed, after charging, the men could go away happy and enjoy their supper. If they watched the machine, as some had done in his place, it was wonderful how it acted; it soon got abreast of its work. It ran perfectly smoothly; and they could always tell by the checking of the wheels, and the action of the brake, if there was trouble ahead. Mr. Waller seemed to have the same idea as Mr. Porter, as to the machine; but if they took it to pieces and saw how it was put together, they would appreciate it in a moment. It was not complicated; it was very simple in every way. Mr. Tobey did not seem to fall in with the idea of the apparatus; but he (Mr. Dunn) knew that he had a plain duty, and that duty was to do all that he could to further the interests of the Association. He thought therefore that by bringing forward this thing, no matter although it was small and insignificant, it was a step in the right direction. He was prepared to be criticized; but he would say this—that, having tried the apparatus for five months, he was perfectly satisfied that it was not to be laid by. And they would find that it was a notion which would be applicable to the regulation of other things—such, for instance, in electric motors, checking off the spent energy. It would also be applicable to machines, both pneumatic and hydraulic. He had tested it in every possible way; and when any gentleman had come to his place, he had put himself to any trouble, purposely to give it a chance of making a mistake. It had, however, never done so yet. He could say this, that in large or small works it was bound to come into use. There was no doubt about its acting promptly; because the moment the governor acted in the slightest degree, the motion was transferred to the check-wheel, and the check went on. Mr. Drury referred to large works. Unfortunately he had had no experience in large works; but he trusted it was not thought there that gas-engines were not worthy of encouragement. He knew that the apparatus was much finer in its work than the steam-regulating valve, because he had seen it and tested it, under various conditions. As to Mr. Ford's question, in summer he worked his stokers six days a week. He put them off on the Sunday, and damped down. In winter they worked seven days a week; but if he were to slack the whole of his retort-lids at a given moment, they would come to a standstill, but the engine would be working all the time.

Mr. W. HARDIE, jun. (Tynemouth), proposed a hearty vote of thanks to the President and to Mr. Dunn. They had, he said, all looked forward to the meeting at Scarborough for some time. They knew they would have a successful gathering; and he thought that the meeting they had had well repaid them all for the trouble they had taken in coming to it. Mr. Holliday's address was brimful of up-to-date matter, which, he thought, would be a positive help to the great majority of the members of the Association, and to the gas industry generally. The paper they had had from Mr. Dunn was also, he thought, one which stood very well in order, as regarded a paper. The subject was thoroughly well chosen. It was a most interesting matter; and there could be no doubt from the way in which the mechanical contrivance shown had worked, that it was one of the most beautiful things they had had put before them for many a day. There seemed no doubt that the machine was capable of performing what it professed to do. Whether it did it better than the ordinary gas-main bye-pass and the ordinary steam throttle-valve, remained to be seen. A great many of them had worked with both appliances. He need scarcely say that he had seen diagrams better than those which had been shown to them. Working with this apparatus, a diagram could be kept constant, day after day, and week after week; and he thought that was a very good thing. Steam throttle-valves did sometimes stick, and they were then very troublesome. As regarded gas-engines—well, they did not all like to churn their gas over again. He might say that he had the pleasure of going to the gas-works at Scarborough that morning, and he was much struck with the diagrams that Mr. Holliday had on his register. It would be very difficult to beat them; and as far as he (Mr. Hardie) could see, the results were obtained neither by an arrangement of the sort shown nor by a steam throttle-valve. Mr. Holliday seemed to have some special arrangement of his own. But he thought that, perhaps, the getting of a nice diagram was not altogether dependent upon the throttle-valve; it was, to some extent, dependent upon the field they had to run upon, in their hydraulic main, or something of that sort.

Mr. BOWER said he had great pleasure indeed in seconding the motion, and also in supporting the remarks which the

proposer had made. Some of them, who had been members of the Association for many years, expected great things of the President; and they had not been disappointed. He (Mr. Bower) was quite sure the dignity of the Association would be maintained throughout the coming year. He believed Mr. Holliday had the distinction of being the youngest President of the Association; and, if for no other reason, he thought he deserved their heartiest thanks. The fact that he had undertaken the duties of President at such an early stage in his career, entitled him to their cordial approval. With regard to Mr. Dunn, as he had said before, they were much indebted to him for the matter he had put before them. No doubt many would think more carefully over the matter than they had had the opportunity of doing that morning. They were reminded of what their friend Mr. Ford had so often told the Association—that the young men were not following the old men; and therefore he was especially pleased that Mr. Dunn—a young member of the Association—had come forward, and given them so excellent a paper.

The PRESIDENT said he was extremely obliged to them for their kindness, and for the manner in which the vote of thanks had been put before them. In regard to Mr. Dunn's paper, he thought it was a really admirable production, and one upon which he deserved a great amount of congratulation. The idea of employing gas-engines in gas-works was the right line to follow, if they wanted to introduce gas-engines into other places. With regard to the point about fuel, he did not know that it mattered a great deal whether they were using the fuel on the spot, or were using gas; they were both there to be used. But if they wanted to encourage the use of gas-engines, there was no doubt about it that the right way was to use them themselves, and thereby let other people see that they had confidence in them. The idea of Mr. Dunn's apparatus was a good one; and he believed, as Mr. Dunn had told them, that it would apply to other plant as well as to gas-engines. He hoped that Mr. Dunn's ingenuity in devising this thing would be rewarded in the future.

Mr. DUNN, in acknowledging the vote of thanks to him, said he was very much indebted indeed to Mr. Hardie and Mr. Bower for the kind manner in which his name had been mentioned. It was very encouraging to a young member of the Association to come forward. Their vote of thanks to him would act as a stimulus to all the young members. He chose the subject he did because he had been experimenting with it for some years, and was more at home in it than in any other.

This closed the proceedings of the meeting.

The members of the Association and their friends afterwards dined together in the Grand Hotel. Mr. Holliday again presided. The after-dinner proceedings were of the briefest description, in order to allow the visitors to view the beauties of the town and district, the opportunity for which they largely took advantage of before dispersing for their homes.

Underground Conduits and the Trolley-Wire System in New York.—A remarkable group of street-mains is, according to the "Engineering Record," located beneath the surface of the ground in Amsterdam Avenue, New York City, where there are already six water-mains, each 4 feet in diameter, upon which the entire population of the city depends for the safe conduct of a sufficient water supply. In addition to these, there are two electric subway conduits, one 20-inch and one 12-inch water-main, six gas-mains 8 and 10 inches in diameter, and one 30-inch and one 20-inch gas-main. On account of the importance of these services, an application for opening the avenue to construct a proposed underground trolley line has been refused—and we should think very properly.

Proposed Lease of the Philadelphia City Gas-Works.—We learn from the "Engineering Record" that the United Gas Improvement Company and the Philadelphia Gas Company have made proposals to the City Council to lease their gas-works for 25 to 30 years. The former Company have, it is said, in six years made contracts in more than 100 different cities, and installed 135 sets of plant having an annual capacity of 30,500 million cubic feet of gas. The arrangement proposed contemplates the payment of about $1,000,000 to the city for supplies, accounts, &c., the free supply of 700 million cubic feet of gas for public buildings, the ultimate expenditure of about $13,000,000 in improvement of plant, the maintenance of a uniform price of $1 per 1000 cubic feet for gas sold to consumers, and the payment into the city treasury of a total sum estimated at upwards of $36,000,000, which shall be the excess of prices charged for gas beyond rates of 90 c., 85 c., 80 c., and 75 c. per 1000 cubic feet for different specified periods. The second proposal is to furnish $1 illuminating gas and 75 c. fuel gas, and pay yearly rentals increasing in five-year periods, so as to make a total of $30,000,000 for 25 years. A third proposition has been received from the Bay State Gas Company, who offer to lease the works until 1928, and in payment to provide for the public lighting and maintenance of lamps free, besides giving the city all charges collected above 80 c., 75 c., 70 c., and 60 c. per 1000 cubic feet for the consecutive five-year terms from Jan. 1, 1898, to Jan. 1, 1918, which is estimated to give a total sum of about $50,000,000, based on the quantity of gas used in 1896.

NOTES ON THE ENRICHMENT OF COAL GAS.

(*Continued from p. 682.*)

Enrichment by Carburetted Water Gas.

The production of carburetted water gas for the purpose of enriching coal gas, has now an established position in this country; and the main features of the process are familiar to all gas engineers. Only the intermittent system of manufacture is practically used here. It is so called because the periods of gas production are interrupted at regular intervals for the purpose of restoring the heat abstracted from the fuel by the formation of gas. The continuous system, in which heat is supplied continuously from an external source, to compensate for the abstraction by the gas, has fallen into complete disuse. Many excellent expositions of the theory of the water-gas process have been published in our pages; and Mr. Holgate has recapitulated the chief points of it in his recent paper on "Enrichment." It may not be inopportune to restate them, since the formation of water gas depends on fundamental chemical reactions, which have been thoroughly investigated, and can be set forth with precision. In this it differs from the formation of coal gas and analogous gases by the phenomena of destructive distillation, which even now are very imperfectly understood.

The products of the reaction of steam with carbon vary with the temperature and the relative proportions of the reacting bodies. Given an excess of carbon, and a temperature of about 2000° Fahr., the products are almost wholly hydrogen and carbonic oxide, which may be considered to be formed according to the equation $C + H_2O = CO + H_2$ though actually this result appears to be achieved by two successive reactions. But if the temperature be considerably lower than the above (say, about 1000° Fahr.), then only the reaction expressed by the following equation occurs: $C + 2H_2O = CO_2 + 2H_2$. Between 1000° and 2000° Fahr., both reactions occur; and the carbonic oxide increases, and the carbonic acid decreases, in the ultimate product as the temperature of the reaction rises. Only at temperatures exceeding 1800° Fahr. is the formation of carbonic acid nearly suppressed; and even at 2000° Fahr. a small proportion of it is still found in the product. The relative proportions of the two oxides of carbon in the product of the action of steam on carbon at various temperatures were ascertained by Herr Harris, and stated by Dr. H. Bunte.* Carbonic acid is a very undesirable constituent of illuminating gas. Therefore water gas intended for the enrichment of coal gas must be made with as low a proportion of it as possible; and this proportion, however low, must be removed by purification, in the same manner as carbonic acid is eliminated from coal gas. Since in the manufacture of water gas a decrease in the proportion of carbonic acid in the gas is attended by an increase in the make of carbonic oxide, economy both in the production and in the purification of water gas is achieved by the suppression, as far as may be, of carbonic acid in the crude gas. The means of suppression are evident from a study of the reactions stated above. The temperature of reaction must be as high as is practicable, and certainly must not fall below 1750° Fahr. A high temperature for the reaction is secured by raising the carbon previously to an intense heat, and to a minor degree by using highly superheated steam. Further, the mass of carbon must be greatly in excess of the steam with which it reacts. Therefore the amount of steam admitted to the carbon must not be excessive, and the length of the bed of carbon must be great—and greater the lower the density of the form of carbon employed.

The observance of these conditions is essential to the economical production of water gas; and they are quite independent of the methods by which they are practically secured, and of the subsequent treatment of the gas. It may be premised that no plant or method of working which violates them will be truly economical. They may be secured by the intelligent manipulation of either of the two types of carburetted water-gas plant which are extensively used in this country. Both of these have a generator, consisting of a wrought-iron shell with fire-brick linings. A layer of good non-conducting material should be inserted between the fire-bricks and the shell, so that the hand may, during working, be held without discomfort against the latter. Such isolation of the heat within the vessel economizes fuel. The generator is charged with carbonaceous fuel—such as gas-coke, which is commonly employed in this country, or anthracite, which is more generally employed in the United States. After initial ignition, the fuel is raised to incandescence by a blast of air at a pressure of 12 to 15 inches of water. In modern forms of either type of apparatus, the blast may be directed from top to bottom or from bottom to top of the generator. With a deep bed of fuel, the ultimate products of the action of the blast are almost wholly carbonic oxide and nitrogen, or, roughly, the mixture well known as producer gas. The formation of the carbonic oxide from the carbon of the fuel and the oxygen of the air, is accompanied by a development of heat. About 4360 British thermal units are evolved per pound of carbon entering into the combination. To this evolution of heat, the increase in temperature of the

* See "JOURNAL," Vol. LXIII., p. 484.

fuel in the generator is due. The producer gas is inflammable while hot, and theoretically should be capable of yielding a further 10,185 British thermal units per pound of carbon contained in it. In the carburetted water-gas apparatus used in this country, the heat derived from the combustion of the producer gas formed in the generator is applied to the gasification of the oil with which the simple water gas is carburetted. In reality, the producer gas is capable of yielding more heat than is requisite for the gasification of the oil; and a considerable proportion of this heat is inevitably wasted. But as a matter of fact, the producer gas generally contains about 5 per cent. of carbonic acid; and therefore the heat generated by its formation is greater than that stated above, and the heat from its combustion is less.

Herr C. Dellwik has lately patented improvements in the water-gas process, which may prove of service in the production of carburetted water gas. An abstract of his patent specification was given in the "Register of Patents."* The aim of his invention is so to proportion the height of the fuel-bed to the pressure—and therefore the volume—of air, that carbonic acid only is formed in the generator in place of the carbonic oxide made by the ordinary process. The fulfilment of his aim would realize the liberation in the generator of the heat from the combustion of producer gas, as well as the heat of its formation. In other words, one pound of carbon should yield in the generator 14,545 British thermal units, in place of 4360 as by the ordinary process. The result of this greater development of heat in the generator is that a higher temperature is readily obtainable, and the duration of the blast may be greatly lessened. The efficiency of the apparatus as a water-gas producer is immensely increased, since 3⅓ times as much heat is obtained from every pound of fuel burnt for the purpose of raising the temperature of the fuel-bed as is secured in the ordinary water-gas generator. Fuel is economized, and time is saved through the shortening of the periods of blast. On the other hand, producer gas is not obtained; and therefore if the Dellwik process were applied to the production of carburetted water gas, some other fuel would be needed for the gasification of the oil. A portion of the simple water gas might be used as fuel for the purpose; but at present the process appears only to have been employed to make simple water gas. How far the inventor has achieved his aim, may be gathered from the fact that, according to Professor Lewes, fifteen analyses of the spent blast gas from a Dellwik generator showed an average percentage of carbonic acid of 17·24 † As already stated, the producer gas from an ordinary water-gas generator usually contains less than 5 per cent. of carbonic acid. The proportion in the Dellwik spent blast gas, proves that very little carbonic oxide can be contained in it, since the volume of nitrogen associated in air with the volume of oxygen necessary to form the above volume of carbonic acid, is nearly sufficient to make up the total volume of the gas. The development of the Dellwik process will certainly modify the type of generator used in carburetted water-gas installations.

The production of producer gas in the generator is continued until sufficient carbon has been consumed in it to raise the temperature of the body of fuel to at least 2000° Fahr. The air-blast is then shut off; and in place thereof, steam at about 120 lbs. pressure is admitted, and passes through the fuel in the same direction as the air-blast. The steam is decomposed, and water gas is produced according to the reactions already explained. When steam is first injected (or when the "run" is commenced), the gas made is almost free from carbonic acid; but as the energy absorbed in gas making is derived from the fuel, the heat of the fuel-bed rapidly diminishes as the run progresses, and the percentage of carbonic acid in the gas increases. The following are the results of observations on the gas made at each completed minute of gas making:—

Percentage of Carbonic Acid in Simple Water Gas.

Minute of run	1	2	3	4	5	6	7
Observation—							
By Writer	0·4	1·0	1·5	2·5	4·0	5·8	..
,, Prof. Crum Brown‡ .	6·9	..	..	8·8	..	..	14·9
,, ,, ,, ,, § .	0·8	..	..	4·7	..	..	12·1

These figures clearly prove that the proportion of carbonic acid rises rapidly as the run progresses. Professor Crum Brown's figures, obtained from different installations, point to a bad condition of the fire in the generator. They also clearly prove the futility of prolonging the run beyond the fifth or sixth minute, unless better heats than usual can be secured in the generator. It can nowhere be economical to make gas—even for one minute out of seven—containing as much as 12 per cent. of carbonic acid. The make of gas diminishes as the run progresses; and the comparatively small volume of about one-third the make of the first minute is actually made in the seventh minute. Since the last portion of a seven minutes' run is characterized by low make and bad quality of gas, there is good reason for following the example of those works where a five or six minutes' run is adopted.

* See "JOURNAL," Vol. LXIX., p. 1192. † *Ibid.*, Vol. LXIX., p. 1417. ‡ *Ibid.*, Vol. LXVII., p. 642. § *Ibid*, p. 643.

The run or period of gas making is ended by shutting off the steam. The air-blast is then again brought into play, in order to raise the temperature of the fuel. If in the preceding blast the air had entered at the bottom of the generator, then in the next blast it is usually admitted at the top. The blows—as the periods of air-blast are called—and runs are continued alternately, until the fire needs cleansing of clinker and ash. This operation is performed every eight or twelve hours, and occupies from 20 to 30 minutes. The generator is supplied with fresh fuel at intervals of about 45 minutes. The duration of the blows is usually 4 or 5 minutes. It is often convenient to make blows and runs of the same duration—say, 5 minutes.

Thus far the two prevalent types of carburetted water-gas plant are very similar in structure, and work in nearly the same manner. The apparatus for the production of oil gas and the blending of the water gas and oil gas differs considerably. The type first adopted in this country is commonly known as the "double-superheater" type, and has been frequently described in the "JOURNAL." An excellent illustration is given in Vol. LXIII., p. 909, and will be found to be precisely similar to the drawing used by Mr. Holgate to illustrate his description of water-gas apparatus in his recent communication to the Institution of Civil Engineers. He does not describe the other type of apparatus, which is known as the Merrifield-Westcott-Pearson setting, and is in operation at Birmingham and other large works. This plant has been illustrated and described in these pages.*

The double-superheater plant has two vessels, filled with chequerwork, for the gasification of the oil and the admixture of the oil gas and water gas. The blast-products from the generator pass through these vessels, and are burnt by a regulated supply of air under pressure to each vessel. The first vessel is known as the carburettor; and so much air is supplied to it as will suffice to bring into combustion sufficient producer gas to impart to the chequerwork the heat necessary for the gasification of the previously heated oil. The next vessel is known as the superheater; and sufficient air is supplied to it to consume the unburnt producer gas, and thus to raise the chequerwork to the temperature which has been found suitable for the "fixing" or superheating of the mixed gases. The spent gases or products of combustion pass away through a stack-valve at the top of this vessel. During the "run," the simple water gas passes from the generator to the upper part of the carburettor, where it meets a spray of previously heated oil. The oil is gasified as it passes down through the chequerwork; and the oil gas is thus produced in the presence of the water gas, and passes away with it through the superheater to a seal in which tar is deposited, and thence to a scrubber and tubular water condenser.

The Merrifield-Westcott-Pearson plant chiefly differs from the double-superheater type in having one tall vessel in place of the carburettor and superheater of the latter plant. The lower part of this vessel is spoken of as the superheater; and the oil is admitted just below the base of the upper part, which is known as the fixing chamber, and is packed with chequerwork bricks. The superheating and fixing chambers are heated by the combustion of the producer gas formed during the blow, as in the case of the double-superheater type. There are many minor points of difference between the two plants. Both are, of course, provided with the valves and doors necessary for operating the apparatus. Particulars of these may be learnt from the numerous descriptions given in the "JOURNAL" during the past six years.

The treatment of the oil in the apparatus is a point of vital importance. In the double-superheater type, it is heated by passage through a tube or tubes warmed by the sensible heat of the gas made during a run; and thus heated, it is sprayed through the top of the carburettor on to iron-bars and the brick chequerwork. The stream of water gas passing through the carburettor at the time sweeps on the oil vapours and gas at a rapid rate, and prolonged contact with the hot surfaces is avoided. Nevertheless the heat of the carburetting chamber should be sufficiently high to convert the whole of the oil into gaseous products, which will not readily condense. These products appear to consist very largely of aliphatic hydrocarbons; and the function of the superheater appears to be the conversion of a large proportion of these hydrocarbons of comparatively low vapour tension and poor illuminating power into aromatic hydrocarbons and hydrogen. In this process a certain amount of carbon must necessarily be thrown out of combination; and this is deposited on the chequerwork which, as the work continues, becomes visibly coated with deposit, and loses its efficiency. The deposit is burnt off at intervals of a week, by the aid of the air-blast. No doubt when the heats are high, a portion of this deposited carbon combines with undecomposed steam and carbonic acid passing from the generator. In the other type of plant, the oil is first vaporized in the superheating chamber, which is the coolest part of the apparatus; and it is then swept on to the hot chequerwork of the fixing chamber. The gas produced appears to be very similar in composition to that made by the double-superheater type.

The composition of a number of samples of water gas is shown in the annexed table. Mr. Holgate gives four analyses of carburetted water gas made in America—presumably from

* See "JOURNAL," Vol. LXIX., pp. 234, 648.

Composition of Water Gas.

Description of Gas	Simple Water Gas.				Unpurified Carburetted Water Gas.			Purified Carburetted Water Gas.				
Authority	Prof. V. B. Lewes.	Mr. C. Hunt.	Prof. Crum Brown.	Prof. V. B. Lewes.	Prof. Crum Brown.	Mr. J. T. Westcott.	Prof. Crum Brown.	Prof. Crum Brown.	Mr. J. T. Westcott.	The Writer.	Prof. Crum Brown.	The Writer.
Reference	"Journal," LXIII., p. 385.	"Journal," LXIX., p. 469.	"Journal," LXVII., p. 643.	"Journal," LXIX., p. 1417.	"Journal," LXVII., p. 643.	"Journal," LXIX., p. 649.	"Journal," LXVII., p. 642.	"Journal," LXVII., p. 643.	"Journal," LXIX., p. 649.	..	"Journal," LXVII., p. 643.	..
Illuminating power of the purified gas in candles	Feebly luminous.				21·0	22·7	25 to 26	21·0	21·37	23·33	23 to 24	25·43	26·47
Specific gravity (air = 1)	..	..	..	..	..	..	..	..	0·592	0·59	..	..	0·63
Percentage composition—													
Hydrogen	48·31	50·96	48·1	51·56	28·7	29·4	32·2	28·8	32·8	38·9	28·2	33·4	32·2
Carbonic oxide	35·93	45·56	47·1	38·58	30·1	27·1	32·8	32·1	22·7	34·5	32·0	29·6	33·0
Methane, &c.	1·05	..	34·2	..	20·7	22·3	16·5	21·2	26·2	11·3	21·2	17·8	14·4
Other hydrocarbons	..	..	..	..	11·8	10·3	10·5	11·7	13·9	10·7	12·3	11·8	13·4
Nitrogen	8·75	0·03	3·9	3·93	4·6	7·4	2·8	5·9	4·4	3·9	6·3	6·4	6·4
Carbonic acid and sulphuretted hydrogen	5·45	3·45	0·9	4·40	4·1	3·4	4·2	0·2	..	0·3	..	0·4	..
Oxygen	0·51	..	8·8	0·73	..	0·1	..	0·1	..	0·4	..	0·6	0·6
Remarks	..	Typical average composition.	1st	4th	7th	..	One of the figures should probably be higher by 1·0	..	..	..	..	Average from several analyses	..
			Minute of run.										
			..	By Dellwik process. (Average of three tests.)	..	..	..	..	..	..	..	..	..

American petroleum and anthracite—and therefore not of great interest to English gas engineers. He also gives the analysis made by Messrs. Goulden and Paddon of the Beckton product in 1891*, when very inferior oil was in use, and the plant was yielding bad results. He further gives an analysis of unpurified Beckton gas in 1894, by Messrs. Humphreys and Glasgow. Its figures exhibit curious analogies with Messrs. Goulden and Paddon's results. The illuminating hydrocarbons and the hydrogen are exactly 2 per cent. and 3 per cent. higher respectively, and the methane exactly 5 per cent. lower; while the other figures are identical! Such a resemblance (or difference) between analyses of two samples of gas, one of which was manufactured three years after the other, is more than curious. Mr. Holgate certainly cannot be congratulated on the six analyses which he quoted in his recent communication on "Enrichment." With regard to those given above, it will be observed that the percentages of carbonic oxide and methane appear to vary unaccountably. This must be chiefly due to differences in the quantity of oil used in the manufacture. The average figures for 25 to 26 candle purified gas found by Professor Crum Brown very closely resemble those arrived at by the writer for gas of 25·43 candles; and they may be regarded as truly representative of the average composition of such gas.

(To be continued.)

THE BANDSEPT INCANDESCENT BURNER.

Readers of the "Journal" are aware that M. Bandsept, of Brussels, has devised an incandescent gas-burner which has been highly spoken of by Professor Lewes, and for which unusually good working qualities are claimed. The British rights in the invention having been acquired by Mr. C. E. Masterman, Assoc.M.Inst.C.E., it will probably not be long before an opportunity will be afforded for comparing the laboratory results with others obtained in every-day use, especially in view of the statement made by Mr. Sayer, the Borough Gas Examiner of Ipswich, at the recent meeting of the Eastern Counties Gas Managers' Association (see *ante*, p. 579). In the meantime, opportunity may be taken for briefly re-stating the principles on which the burner, which has been described in our "Register of Patents,"* has been constructed, as set forth in a paper read by the inventor before the Belgian Association of Gas Managers, and showing the effect of the embodiment of those principles in an appliance for general illumination.

The light-giving property of incandescent gas-burners depends largely upon the exactitude with which the proportions of the air and gas sent into the burner are regulated, and the intimacy of their admixture at the point of combustion. In the burners generally employed, the mixture is not homogeneous. Consequently, the flame does not attain the maximum temperature in all its parts, and the incandescent body is prevented from yielding its highest lighting effect. Apart from this, the mantle is exposed to variations which detrimentally affect not only its durability but its shape; and a misshapen mantle will not work satisfactorily. When the volume of air is admitted to the burner in the right proportion, the temperature is equal all over the flame, and the mantle becomes irradiated from top to bottom with a brightness which borders closely upon the maximum. In order to effect a perfect admixture of the gas and air, the injector should convey a much larger proportion of air than that supplied to ordinary bunsen burners; the streams of gas and air should be made to mingle intimately, and not merely at their surfaces; and, finally, the molecules should have such movements as to facilitate admixture, so that they may enter the flame in a nascent condition.

It is claimed for the self-mixing atomizer burner of M. Bandsept that it fulfils these requirements. When used with the Welsbach mantle, appreciable, and sometimes considerable, economy is effected. This will be shown by the following results of laboratory experiments: With a consumption of 3·7 cubic feet of gas per hour at a pressure of 20-10ths, the light yielded was equal to 110 candles, or at the rate of nearly 30 candles per cubic foot. A second experiment, using 3·cubic feet of gas per hour at a pressure of 14 10ths, gave a light equal to close upon 89 candles—approximately, 30 candles per cubic foot. A trial was made with a slightly smaller quantity of gas (2·95 cubic feet) at a pressure of 10-10ths, and a light of 84-candle power was the result—roughly, 28 candles per cubic foot. The gas-inlet was then enlarged, and a trial made with 3·28 cubic feet of gas per hour, consumed at a pressure of 6-10ths. The result was a light equal to 71 candles, or at the rate of 21·6 candles per cubic foot. Other experiments were equally satisfactory. In no case was the mantle forced. This was shown clearly by the spectra-photometer. The exact proportioning and atomization of the mixture of gas and air produce uniformity of temperature in the portion of the flame in which combustion is active, and to which only sufficient air is admitted to bring about the final reactions, which take place in the interior of the tissue of oxides. Under these conditions, the mantle yields its intrinsic illuminating power; and its life is lengthened because it is not subject to the varying effects of incomplete combustion, influenced by outside disturbances.

* See "Journal," Vol. LIX., p. 908. † *Ibid.*, Vol. LXVIII., p. 503.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Enrichment of Coal Gas.

Sir,—We have read with great interest the papers on gas enrichment which you are publishing in the "Journal," and note in the issue for Sept. 21 a reference to the enriching spirit which we are producing.

The details there given were furnished by us to Mr. Holgate, some three years ago, from the information then in our possession; but from continued use on a practical scale in several gas-works, extended down to the present time, it has been conclusively proved that our product has three times the enriching power of carburine and other light petroleum spirits, which is a very much higher value than that given in your article.

Stratford, E., Sept. 27, 1897. Davies and Roberts.

Gas Testing in London.

Sir,—You have been good enough to give me considerable space for the discussion of the above subject. I am therefore reluctant to ask you for more. But the London County Council will shortly appoint a new Chemist and Superintending Gas Examiner in place of the gentleman who has resigned; and this is my apology for asking you to indulge me again. The appointment should very much concern the Gas Companies within the Metropolitan area, and incidentally those all over the country. There is a rumour to the effect that a "young gentleman" has already been "nominated" for the post. Let us hope that this is not the case.

Since the death of Mr. T. W. Keates there have been almost endless discussions and great friction with reference to gas testing, including the form of the photometer, the quality of the candles, the candle-balance, the disc, the times of testing, and many other matters, that have seriously interfered with the comfort of those whose business it is to supply gas to the public. A few years ago this assumed a very acute form indeed; so much so that Mr. George Livesey bluntly stated, at a meeting of his Company, "that most of the Gas Examiners sent by the London County Council were young men from the hospitals, who knew little or nothing about the work." In this I do not agree with Mr. Livesey. Very few of the then Gas Examiners ever had anything to do with hospitals, and the few that had were the best; and these few soon resigned, for reasons well known.

To support this statement, the following strange appointments were, to my knowledge, made: A draper's assistant, a butcher's assistant, an accountant's clerk, a stockbroker's clerk, and a few others equally incongruous. So far as could be learnt, not one of these had any special chemical training. In another large city, a tinman was appointed; and in yet another, a lamplighter. One of the last two cost the gas company some thousands of pounds. Not long since I read the admission of a very important Gas Examiner to the effect that before his appointment he only had a few weeks' training. Need I add that this gentleman has been in constant conflict with the gas company.

I once discussed this matter with the late Mr. F. W. Hartley, who was, in my opinion, the greatest authority on gas testing that ever lived. His work on photometry was the most exhaustive ever written; and it has been very diligently plagiarized. He said: "A gas examiner should be a sound chemist, and have had at least one year's training in a testing-station." It does seem strange that these imperfectly educated and inexperienced men should have the power to inflict penalties on gas companies, for alleged deficiencies of illuminating power, and excesses of impurity. It is all very well to state that the aggrieved company can appeal to the Chief Gas Examiner; but it is safe to say that he is hardly in a position to pronounce an opinion. This will be obvious.

In appointing the men I have described, someone or other must be to blame. So soon as they found themselves in charge of a station, they began to play all sorts of tricks—such as "tinkering" the photometer, cutting holes in the sides, removing the top, &c., with a view to improving the ventilation of an excellent instrument that had been "certified by the Gas Referees" as perfect. This, Sir, was the result of what you euphemistically called the "piping" from Spring Gardens to which the Gas Examiners were expected to "dance." A few refrained from these menial offices, and speedily found themselves in very warm water.

Matters went on thus for some years—indeed, till the trial between the Dublin Corporation and the Gas Company, when Mr. W. Sugg, in letters to the "Journal," vehemently protested against the absurdity of the evidence given at the trial by London Gas Examiners inspired from Spring Gardens. After this came about the long discussion anent the portable photometer, and the discordantly abnormal results said to have been obtained by that instrument, and reported to the London County Council, when the Gas Companies were charged with deliberate and premeditated fraud. Colonel Makins, in commenting on this report, was very much shocked; and he declared that his Company, which was "a *quasi*-Government Department," was as honest as Spring Gardens, which was not saying much. The practical head, and firm but dexterous hand, of Mr. George Livesey grasped the subject at once, by simply stating that his Company sent out 16¼-candle gas. This was found at the fixed stations; and as the portable photometer was not a legal instrument, he cared nothing about it—thus, Cervantes-like, laughing the Spring Gardens nonsense away.

I have referred to these matters simply to call attention to the fact that it is necessary these charges should cease or be proved, and that the next Chemist and Superintending Gas Examiner to the London County Council should be (1) an experienced man, (2) an impartial man, (3) a man without "fads," and (4) a man who will superintend the Gas Examiners, and not try to usurp the functions of the Gas Referees.

342, *Strand, W.C., Oct.* 1, 1897. J. V. Taylor.

The Manurial Value of Sulphate of Ammonia.

Sir,—On reading an article in the "Journal" respecting the renaming of sulphate of ammonia to make it more palatable to the British farmer, it appeared to me to have on the face of it something of the ridiculous. The farmer's intellect has never stood very high in the minds of the general public; but I do not think it is so far down that he is to be caught by the scheme proposed by Mr. Carulla. Perhaps the farmer is not altogether the ignoramus he is represented. My principal object, however, in writing this letter, is to let brother farmers know what success I and my sons have had in the use of sulphate the past few years. Since last Christmas we have used 20 tons for grass and for corn, wheat, barley, and oats; and we find it retains its manurial value much more than nitrate of soda in wet seasons. We consider it the cheapest manure at its present price we can buy.

Canes, near Harlow, Sept. 30, 1897. G. Hart.

Practical Observations on Gas Manufacture.

Sir,—Kindly allow me a small space in your valuable paper in which to thank Mr. S. Carpenter for his interesting and instructive article on "Gas Manufacture," published in the "Journal" for the 21st ult. I consider articles of so plain and practical a character to be of great service to working managers; and I beg to express a wish that not only will he give us more of his experiences, but that other managers will follow his example.

Oct. 1, 1897. A Working Manager.

LEGAL INTELLIGENCE.

YSTRAD POLICE COURT.—Monday, Sept. 20.

(*Before Mr.* D. W. Davies, *Chairman, and Messrs.* J. Williams *and* E. H. Davies.)

Refusing to Supply Gas to a Consumer in Arrear.

The Ystrad Gas and Water Company were summoned to-day by Mrs. Amy Watkins, a widow residing at the Britannia Coffee Tavern, Baglan Terrace, Treherbert, for cutting off a supply of gas. The case was of importance, as it raised the question of the right of the Company to decline to supply premises in the occupation of a tenant who was indebted to them in respect of other premises.

Mr. J. Phillips appeared for the plaintiff; Mr. James, the Company's Solicitor, represented them.

The plaintiff was, between April 1 and Aug. 28, 1895, in the occupation, and was supposed to be the tenant, of the Smith's Arms Public House, Treherbert. In respect of this period there became due to the Company a sum of £4 14s. 10d. for gas and water supplied. Of this amount the plaintiff paid £1 1s. 10d. on June 12, 1895; being a quarter's water-rate for the three months ending at Midsummer. On the 20th of May in the following year, a County Court summons was issued against her for £3 13s., the balance of the account; and it was served on her at Cardiff. The case was heard on the 16th of June at the Porth County Court, and, in default of appearance, judgment was given against the defendant for the full amount, with costs. On Sept. 26, 1896, an execution order was issued against her; and it was returned, as defendant was "not to be found." It was re-issued on the 9th ult. to the Britannia Coffee Tavern; and it was returned with the intimation that the furniture was claimed by two parties (relatives) under a deed of settlement made in 1888. Previously, however, on Aug. 26, official application for a supply of gas in respect of the premises had been received by the Company from Mrs. Watkins; the outgoing tenant (Mrs. Collins, her sister) not giving any notice of leaving. On the following day, notice was sent to Mrs. Watkins that the gas would be cut off, as she was in arrear for gas already supplied to her. To this Mrs. Collins replied, expressing surprise at the Company taking this step, as she had arranged with their collector (Mr. Llewellyn) to be responsible for the gas consumed. He, however, did not concur in any such arrangement, but told her that, as Mrs. Watkins was already indebted to the Company, she had better call at the office herself. The General Manager (Mr. A. R. Cawley) also informed her by letter that, Mrs. Watkins being in occupation of the premises, and being in arrear for gas previously supplied to her, she (Mrs. Collins) had no right to interfere in the matter. Thereupon Mrs. Watkins wrote denying that she owed the Company anything, never having, as she asserted, kept the Smith's Arms, but being merely the landlord's housekeeper. She expressed her willingness to pay a deposit. It appears that, as a matter of fact, she took possession of the premises from the outgoing tenant; but the Magistrates refused to grant her the transfer of the licence, and it was then obtained in the name of her brother, though no intimation of this was forwarded to the Company. On the 8th of September the summons was taken out; and when the case came on it was simply argued—no evidence being called.

The chief point relied upon by the prosecution was that the premises from which the supply of gas had been cut off were not those in respect of which the outstanding liability to the Company, which they put forward as justifying their action, was incurred. But before the plaintiff's Solicitor could make this point, the Bench interposed the remark that the premises were entirely different—as though, before the hearing, they had been furnished with particulars, and had come to a decision upon the case. He maintained that the Company were bound to supply the plaintiff with gas, especially as she had offered to pay a deposit. It was contended, on the other hand, by Mr. James that the Company had a legal right, after giving 24 hours' notice, to cut off the gas, inasmuch as the plaintiff was already indebted to them. He argued that if a person had half-a-dozen shops, and was in arrear, the Company had the right to withhold the supply from all the premises. Mr. Phillips denied that there were any arrears; and he quoted section 16 of the Gas-Works Clauses Act, 1847, to show that it was only from "the premises of such person" as neglected to pay the gas-rent that the supply could be cut off. The Bench held that the words quoted meant the premises upon which the gas had been consumed, and therefore that they did not refer to the coffee tavern then occupied by the plaintiff, even assuming that she was responsible for the arrears at the Smith's Arms. The Magistrates' Clerk (Mr. Porcher) concurred; remarking that there was only one interpretation of the clause. The Chairman said the case was very clear to the Bench; and they imposed a fine of £5 and costs.

A Disputed Gas Account.

At a recent sitting of the Brentford Petty Sessions, Mr. Minns, of Bell Road, Hounslow, was summoned by the Brentford Gas Company for £5 16s. 7d., being the amount of gas and meter rental for two quarters. Mr. Emmerson, a collector of the Company, stated that the defendant had nine lights in his shop and the room adjoining. A careful examination had been made of the amounts paid in former years; and they agreed in the main. The meter had been tested by the Company's men, and found to be sound and intact. Mr. Bugby, one of the Company's inspectors, gave evidence to the effect that he had tested the meter, and found it correct. In cross-examination, he said the consumption in the quarter ending Christmas was 13,000 cubic feet; and in the Lady-day quarter, 28,000 cubic feet. In the March quarter of 1894, it was 8700 cubic feet. The Chairman (Mr. M. Sharp) remarked that he did not think the averages of the consumption would be evidence; the Court being bound by the meter. Mr. Robinson (for the defendant) dis ented from this. The Chairman proceeded to point out that the Act stat d the meter must be *primâ facie* evidence of the amount of gas consumed; and he regretted that the meter had not been tested by an independent authority. Defendant observed that he objected to paying the 5s. required before a test is made by a Government Inspector; but Mr. Emmerson informed the Court that the Company would refund the money if the meter was found to be wrong. Mr. Robinson thought the jump from 8700 cubic feet in one quarter to 28,000 feet in a corresponding period was too big; and he declared that the mechanism of the meter must have been at fault. A remark by the defendant to the effect that the Company's inspector admitted the meter was old, and ought to be replaced, led Mr. Emmerson to observe that the meters were renewed every five years. The Chairman said he noticed that in the summer quarter the consumption was 10,000 cubic feet; and in the quarter ending Christmas, it was only 13,000 feet. This seemed to indicate that the meter must have been at fault; for nothing like so much gas would be required in the summer as in the winter. The Bench would adjourn the case for further evidence; and they thought that the Company might come to terms with defendant.

The Compulsory Taking of Land for Water-Works Purposes.

At the West Riding Police Court last Tuesday, before Messrs. T. W. Jeffcock and T. Cadman, Mr. H. Sayer, the Town Clerk *pro tem.* for Sheffield, made an application with regard to the purchase of land required for the new water-works of the Corporation at Langsett. He said the application came under the provisions of the Land Clauses Consolidation Act, 1875. The owners of the land in question refused to give possession at once, and under the Act power was given for possession to be taken where ground was wanted for the immediate purposes of the work—the compensation to be afterwards settled as provided by the Act. The whole of the land required for the railway from Stocksbridge to Langsett had been given up by agreement, as had the land at the side of the reservoir. In this case, however, the Solicitors to the Trustees of Mr. Emor Green Wrigley, the owner (Messrs. J. Clayton and Sons, of Ashton-under-Lyne), declined to give possession, and seemed to be determined to have an arrangement as to the purchase of the land, before they did so. A witness was called who stated that the land measured 21 acres 2 roods 6 perches; and the portion immediately wanted was only 3 acres in extent. Mr. Sayer said the purchase-money would be deposited in the bank in the joint names of the Corporation and the Trustees of Mr. Wrigley; and a bond would be given under a sum which would be settled. A surveyor, to decide upon the amount to be paid into the bank, would have to be appointed. The application was granted; Mr. J. Wade, of Barnsley, being appointed to value the land.

Smoke Nuisance at the Manchester Gas-Works.

At the Manchester City Police Court last Wednesday, before Messrs. T. C. Middleton and J. M. Elliott, a case was heard in which the Lord Mayor, Aldermen, and citizens of Manchester were charged with creating a nuisance by permitting the emission of black smoke from a chimney in connection with one of the retort-houses at the Bradford Road gas-works. Mr. A. T. Rook, the Superintendent of the Sanitary Department of the Corporation, explained that the proceedings, instead of being taken as usual by the Sanitary Committee, as the Sanitary Authority, were instituted by an inspector as an inhabitant of the city; and the information had been laid by him under section 105 of the Public Health Act. Under this section, the Magistrates could make an order without the preliminary notice which was required when the proceedings were instituted by the local Sanitary Authority, and in case of disobedience penalties could be enforced in the usual way. He understood it was not the intention of the Gas Committee of the Corporation to oppose the making of the order, as they had no desire to be treated differently from other people who were frequently summoned for a similar offence. Moreover, they admitted that there was no necessity for the existence of the nuisance, which arose solely from the neglect and carelessness of their workpeople. The Bench made the order as applied for.

Scottish Law Agents and Private Bills affecting Scotland.—On the occasion of the annual meeting of the Incorporated Society of Law Agents in Scotland, held in Dundee last Thursday, Dr. Barty, the President, in his opening address, remarked that the community generally was opposed to the present system of inquiries with reference to Scottish Private Bills. The system involved great and unnecessary expense, a needless double inquiry by both Houses of Parliament, and the impossibility of men of moderate means defending their lawful rights. A local inquiry in Scotland would result in many people petitioning against Private Bills, and defending what they deemed to be their rights, who were at present debarred from doing so by the expense. With regard to Provisional Orders Bills, he thought they all recognized the great abilities, untiring energy, and knowledge of Scottish business which Lord Balfour possessed; and he believed they would be disposed to view with favour every Bill affecting Scotland which he introduced.

MISCELLANEOUS NEWS.

THE AMBLESIDE GAS-WORKS ARBITRATION.

Continuing our report of the proceedings before the Umpire and Arbitrators appointed to determine the price to be paid by the Ambleside District Council for the Gas Company's property, we this week publish a summary of the evidence submitted on behalf of the first-named body. The Umpire was Mr. CHRISTOPHER OAKLEY; and the Arbitrators were Messrs. CORBET WOODALL for the Company, and Mr. STEPHEN SHAW for the District Council.

Mr. CRIPPS, Q.C., and Mr. RICKARDS appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. BLENNERHASSETT, Q.C., for the District Council.

Mr. BALFOUR BROWNE intimated that he did not propose to address the Court, but would at once call his witnesses.

Mr. *Arthur Silverthorne*, Assoc.M.Inst.C.E., said he was consulted in 1893 by the Local Authority of Ambleside as to the purchase of the gas and water undertakings; and he advised that £14,000 should be paid for them. His valuation of the gas-works then was £8672; and of the water-works, £7410. But from the latter sum he deducted £2030 on account of the works being situated on leasehold land. This made £14,052, to which he added £50 for the fitting trade and £20 for manager's salary, and deducted £300 for mains which, he was informed, were not satisfactory. He heard subsequently that Mr. Hepworth had valued the undertaking at £24,020; and he was of opinion that the payment of this sum would involve the Local Authority, if they accepted it, in a rate-in-aid—in other words, the annual liability, including interest and sinking fund, would exceed the income which the Company could convey to the extent of £253 a year. He worked this out as follows: Cost of conveyance, £120; working capital, £883; and deficient plant, £1250. These sums, added to the £24,020, made £26,273. He reckoned that interest, at 3½ per cent., would come to £854; and the sinking fund, at 3 per cent. over 45 years, to £271. These sums came to £1125, and with the cost of the Act of Parliament (£120), made a liability of £1245.

The UMPIRE pointed out that the £120 would not be an annual charge.

Witness explained that £120 would be required for ten years to redeem the cost of the Act. He also wished it to be understood that he did not make this calculation at the time Mr. Hepworth made his valuation of £24,020; but he had done so with the assistance of the knowledge obtained by the passing of the Council's Act of 1895. The gross profits in 1893 were £992; and setting this against the liability of £1245, gave £253 to be raised by a rate-in-aid.

The UMPIRE remarked that the sinking fund for the capital and the Act more than accounted for the rate-in-aid.

Witness then stated the grounds on which he advised the Local Authority to oppose the Company's Bill in 1894. One of the arguments which he strongly urged in favour of opposition was that, if the Bill was obtained, it would increase the value of the undertaking against the purchaser. A number of questions were put to witness as to the enormous waste of water in the district; but he could not ascribe the leakage to any particular cause. However, he thought it was a sign of bad management. It was under his advice that the Local Authority promoted the Bill for the compulsory purchase of the Company's works. He was unaware that the Chairman of the Committee before whom the Bill came (Lord Hampden) was a Director of one of the London Water Companies. In the same year, the London County Council promoted a Bill for the purchase of the Metropolitan Water Companies, without any allowance for compulsory sale.

Mr. BALFOUR BROWNE: Lord Hampden decided for compulsory sale in this case?

The UMPIRE: The Committee did; Lord Hampden was not the only member.

Mr. BALFOUR BROWNE: He was the mouthpiece of the Committee.

Examination continued: His opinion was that there was an excess of capital spent on the gas-works; but he was not of opinion that it was in the mains, because he noticed that the relation of the mains to the amount expended on the manufacturing plant was really in the ordinary proportion—that was to say, the mains represented about one-third of the amount expended. On fixed plant and buildings, £5396 10s. had been spent at June 30, 1896; and on mains and services, £2144. The meters were included in the latter sum. Therefore, in his judgment, the over-capitalization was at the works. The potential capacity of the works, in his opinion, was 42,000 cubic feet per 24 hours. There was a very small margin left between the present and the possible production; and he believed the full capacity would be approached next December. He had taken ten retorts as representing the potential capacity of the works.

The UMPIRE: We had it in evidence that there were fifteen retorts.

Witness: There are; but five are for reserve. There might be a breakdown if the whole fifteen were at work without a reserve.

Mr. WOODALL: Both the witnesses on the other side agreed that there must be a reserve.

Witness (continuing) said he thought the production of 5000 cubic feet of gas per mouthpiece, mentioned by Mr. Hepworth, was too high for works of this kind. It would be impossible to increase the supply without a further expenditure of capital. The condensing and scrubbing plant were deficient; and with regard to the purifiers, he had ascertained that occasionally the gas was impure. This he attributed to the fact that there were only two boxes; and that, when they were changed, impure gas had to be sent out. Then as to storage, the potential make of gas being 42,000 cubic feet, the holders should be of equal capacity; but it was only 34,000 cubic feet. Other disadvantages were that the station meter was rather small, and there was no governor. Turning to the consumption of gas, witness said that, taking the aggregate, the increase in the supply in this case was rather high; but when the consumption was allocated between lighting and cooking purposes, he found that the rate of increase for lighting was very small. The quantity of gas sold for lighting purposes in 1890-91 was 4,576,953 cubic feet; and in 1896, it was 5,428,968 cubic feet. This represented an average increase of 3·47 per cent., which was exceedingly small. The quantity of gas sold for cooking was 714,200 cubic feet in 1891, and 2,173,400 cubic feet

in 1896. This was an average increase of 24·93 per cent.; but it was an increasing sale at an unsatisfactory price. Between 1894 and 1896, the consumption of gas for lighting purposes was practically stationary. In 1894, it was 5·4 million cubic feet; in 1895, 5·5 millions; and in 1896, 5·4 millions. This showed him that the element of profit as regarded increased development of supply was by no means so strong as it had been represented. Cooking by gas was a comparatively new thing; and it seemed to him that the point of saturation was very soon reached. He did not think there was much more room for development in this respect in Ambleside. He had looked into the question of the different kinds of coal used in the production of gas. In 1891, 121 tons of cannel were carbonized, or a percentage of 16·38; the cost being 37s. per ton. The quantity used gradually decreased to 1895, when it was 51 tons, or a percentage of 5·67; the cost being 26s. 3d. per ton. In the last account, the quantity was 84 tons, or a percentage of 8·85; the cost being 20s. 6d., which indicated an inferior cannel. The price of the ordinary coal used had also dropped from 19s. 3d. per ton in 1891 to 17s. 6d. in 1896. Although a much greater amount of gas was made, and a larger quantity of coal used, the total sum paid for the latter between 1892 and 1896 had hardly increased. The results of using a decreased quantity of cannel would be a considerable saving, a substantial increase in the profits, and a gas of lower illuminating power. Tests had been made of the illuminating power; and it had been found as low as 13 candles. The average was about 15 candles, which was a diminution of 3 candles in the last few years. Between 1892 and 1896, the profit rose from £461 to £865. In his valuation, he had made certain deductions from the profit shown. For the inferior gas, he thought they should be allowed a reduction of 4d. per 1000 cubic feet, which would represent a difference of £120. The purification charges were inadequate; and he had added £7. A deduction of £24 should also be made in respect of wages, on the ground that it represented the rental value of cottages, which were used by the workmen, and who consequently received less wages. He calculated the repairs and renewals at 6d. per 1000 cubic feet; and therefore he claimed £15 from the reserve fund and the deficiency of £59. These figures represented the difference between his estimate of the repairs as they ought to be, and what he found they were. He also required an allowance of £20 for an office. The Directors' fees (including Auditors), £32 4s., had always been charged to the gas undertaking; and he disapproved of the allocation, which was being made to the prejudice of the Council, between the gas and water undertakings. The other side had transferred £10 to the latter; but he had brought it back again. The Manager was inadequately remunerated; and he added £24 to his salary. He also allowed £35 for a clerk and cashier; and £18 for bad debts at 1 per cent. Printing and establishment charges were also inadequate. He submitted that the meter-rents were not maintainable. They should not exceed £70. Depreciation and repair of meters should cost £29, which brought the net rental available to £41. The Company received £81 0s. 10d. for meter-rents; and £13 15s. 9d. was charged for repairs and renewals. This left the profit on meters at £67 5s. 1d.; and the difference between this sum and his £41 was £26. The rental of cooking-stoves was £26 11s. 8l.; and the value of the stoves was £267. The depreciation upon them ought to be charged at 7½ per cent.; and there should be an allowance for repairs. These two items would make £40; and deducting from this the stove-rents, gave a balance of £14 against the works. These items made a total deduction of £378. He had prepared some tables showing the gross profit per ton of coal carbonized. In the case of the Gas Companies in the Metropolitan district, it was 9·17s. per ton of coal carbonized; in the Provinces, 9·18s.; and gas-works in the hands of Corporations and District Councils, 7·8s. per ton. According to a statement put forward by the Ambleside Company, in their case the profit per ton was 11·84s. in 1892; 19·15s. in 1895; and 18·96s. in 1896. From these figures, he concluded that the profits were unduly inflated. The average profit from 1890 to 1893 was £483 12s., or 13·89s. per ton of coal. In 1894, the profit was £672; 1895, £838; 1896, £865 17s. 10d. Between 1893 and 1896, the profit of the joint undertaking went up from £992 19s. 11d. to £1358 3s. 1d.; and £310 of the difference applied to gas. This appeared to him to be somewhat remarkable, seeing there had been a decrease in the consumption of gas for lighting purposes; and it led him to adopt this line of investigation. For the purposes of his valuation, he had taken the average of the past three years; and he capitalized the sum at 18 years' purchase. This gave him £8910. Adding 10 per cent. for compulsory purchase (£891) made a total of £9801. For the deficiencies in plant, he had deducted £1250; leaving a balance of £8551, to which he added £400 for the cottages. This made the total value of the gas undertaking £8951. If the works were to be newly constructed, the cost would be £6975; while the outlay, as shown by the books, was £7806. His valuation gave the Company a premium of 40 per cent. on what it would cost to erect the works now; and it also worked out to about £1200 per million cubic feet of gas sold, which was the relative figure in the case of several undertakings which had been transferred. Never to his knowledge had £3000 per million been awarded. He did not consider the condition of the Money Market would affect the number of years' purchase of gas and water undertakings; it had no reference whatever to the value. If the Company had been a statutory one, he should have valued it upon the dividends. In the case of the water-works, he had taken £556 as an average of the gross receipts for the past three years. He had rejected the expenditure as presented in the Company's accounts, because he considered it perfectly inadequate; and he had applied what he regarded as a proper proportion of expenditure in such cases, which was about 27 or 28 per cent. on the rental. He had taken 25 per cent., which came to £139. To this he added as a renewal fund 2 per cent. on £2000, or £40, which was the value of the mains. In the case of Ambleside, the relation of the percentage of expenses to rental was exceedingly low. For 1892, it was 19·07; and in 1896, 15·52. The maintainable profits were £337, which he capitalized at 22 years' purchase. If it had been a statutory company, he should have probably applied 27 years. This gave him £8294, to which he added 10 per cent., £829; giving a total valuation of £9123. This was valuing the concern as a freehold one entirely; and therefore the £1300 paid for the land by the Council would have to come off. His joint valuation was £18,074. This was for a freehold basis; and the deductions could be made afterwards.

Cross-examined as to whether the deductions he had made were justifiable, witness said he did not question the right of the Company to supply 15-candle gas; and he admitted that in the Council's Provisional Order the illuminating power was put at 15 candles. Pressed as to why, if the Company were supplying 15-candle gas, and were entitled to supply it, he made a deduction, he said the only reason he could give was that, at the time he made his former investigation, they were supplying a higher quality. The item of £7 for purifying was in reference to the waste lime. He thought that the £19 obtained for waste lime was very large; and that the Council would not get this amount. He did not impugn the accuracy of the accounts. The reason he deducted £24 18s. from the value of the cottages was that he considered the wages of the men were so much less through occupying them. As to the deduction for an office, in his opinion it was a necessary equipment for a gas company. Questioned as to whether he wished the Arbitrators to deal with the property on any other terms than the value to the selling Company, he said he wished them to deal with it on the maintainable profit conveyed. The money spent by the Company on the buildings and construction of works might have kept them in order; but it was not the average of the proper scale of expenditure. With regard to the addition he had made to the Manager's salary, he could certainly undertake to say that, if they had to engage another Manager, they would not get one at the price the Company had been paying for the last twenty years.

Mr. CRIPPS: Supposing I were so fortunately situated that I could get £200 clear into my pocket, whereas after transferring my property, it cost you £100 to get £100, I am, according to your argument, to be deprived of my additional £100.

Witness: It would come to that in my view.

In further cross-examination, witness's attention was directed to several cases in which a greater number of years' purchase were given than he had allowed. Regarding his valuation for the water undertaking, he did not think any scale of working expenses would be adequate that did not provide 25 per cent.

Mr. CRIPPS: Assuming that the circumstances of a company were such that they could work in an extraordinarily cheap manner, according to your theory you deprive them of this benefit in a compensation case.

Witness: I deprive them of it, certainly.

Re-examined: The Company's charges were the same for gas of 18 or 19 candle power as for 15-candle gas; and the prices were fair for gas of the former quality.

Mr. CRIPPS: We do not admit that the gas is of 15-candle power.

Re-examination (continued): He considered the men's wages were what they were paid *plus* the cottages they lived in. In looking at the item of repairs and renewals, it was fair to take a wider view than one year. If the present Manager was a shareholder, that would perhaps explain the smallness of his salary. As to cooking-stoves, where there was such a development as in this case, charges for depreciation should be established. Regarding the water undertaking, the great waste pointed to defective inspection; and this seemed to be an explanation as to why no repairs appeared, which caused the working expenses to be below the average.

Mr. *C. A. Cunnold*, Assistant Manager at the Ramsgate Corporation Gas-Works, stated that he tested the gas at Ambleside, from Jan. 25 to 28 last, with a standard Evans photometer. The tests for illuminating power were made during the hours of heaviest consumption; and he also examined the gas for sulphuretted hydrogen and ammonia during the day. Sulphuretted hydrogen was found on two days—a slight trace on Jan. 25; and a distinct discoloration on the 26th. Ammonia was present on every occasion. As to the illuminating power of the gas, the average of four tests on Jan. 25 was 15·2 candles. The three succeeding days he took three tests each day; the averages being 14·53, 15·53, and 15·39 candles. The average of the four days was 15·17 candles.

Cross-examined: He spent four days on the tests, and had taken no others.

Mr. *W. A. M'I. Valon*, examined by Mr. BALFOUR BROWNE, stated that he had inspected the Ambleside Gas-Works in 1893, 1894, and in June last. No alteration or improvement had been introduced in the plant since his first visit. The works were badly situated for the distribution of gas, as well as for delivery of coal and sale of residuals. They were very primitive and incomplete. No attempt had been made to conduct the gas by an independent main to the lowest part of the district; and this should be done. Then attached to this main, there should be a governor of sufficient size. For this main he had made a deduction in his valuation. When he was last at Ambleside the service-mains were laid bare in several places, though not at his request. So far as he could judge, the iron of the mains was in very good order; but he could not say how they were connected, or whether there were any leaky joints. The mains were all under 4 inches in diameter, excepting the one leading from the works to the town—about 800 or 900 yards—and that was 6 inches in diameter. Therefore, there was not much margin. He should advise that in certain places, these mains should be replaced by larger ones, as large mains were always conducive to economy. The works at the present time were incomplete for the business they were doing. The evidence of the last witness showed that the purifiers were not large enough, and that the washer-scrubber was not doing its duty. The retort house was a fair building. It contained fifteen retorts—two beds of fives, a bed of threes, and a bed of two's. Twelve of the retorts, he was informed, were alight last Christmas, which only left a reserve of three. He knew that the bed of fives which was at present under fire, would only last another two or three months; and the bed of threes was entirely worn out. As a matter of fact, there were, at the present time, only seven reliable retorts. The make of gas per mouthpiece was 4200 cubic feet—not 5000 cubic feet as had been stated. Unless the retorts were re-set, it would be with great difficulty that the town could be supplied with gas during the coming winter. It was a question whether the present structure was strong enough, or whether it would be safe to underpin the retorts, for the purpose of putting in regenerative furnaces. Anyway it would be a long and costly business. The fittings of the retorts were of a crude kind; and he did not believe there was a single valve from the hydraulic main to the gasholder inlet valve. Such a state of things ought not to exist. The condensers were simply three upright pieces of pipe; and there was no annular space or anything of that sort for cooling. It was not a question of adding to the condenser and scrubber, but of clearing them away, and substituting new ones. The purifiers were just about one-half the size they should have

been for the make of gas last winter. The exhauster was equal to its work. But it was driven by a gas-engine, which, after it had run a few hours, had to stop to cool down; and during the time it was cooling down, the pressure of gas was thrown upon the retorts. The two gasholders, he was told, would store 32,000 cubic feet; and the maximum make being 42,000 feet, there was a deficiency in capacity of 10,000 feet. It had been suggested that the holders could be telescoped; but this could not be done before another was erected. The other buildings on the works were more in the nature of sheds than anything else; and when the Council took over the works, they would have to be re-arranged. His valuation was based on the accounts only. He found that the accounts differed so greatly that he had had those for the five years 1890-94 abstracted. The cost of coal, less residuals, on the average of the five years, was 1s. 8·28d. per 1000 cubic feet of gas sold. In 1896, it was 1s. 5·08d.; so that there was a difference of 3·2d. The total working expenses per 1000 cubic feet of gas sold averaged in the five years 1s. 7·40d., as against 1s. 3·42d. in 1896. So that there was a difference on coal of 3d., and 4d. on working expenses, without going into other items. The cost of coal on the average of the five years (before deducting the residuals) was 2s. 8·45d. per 1000 cubic feet of gas sold; and for 1896, 2s. 2·71d.—a decrease of 5·74d. The total saving was £181 15s. 4d.; and deducting residuals £80 8s. 8d., showed that coal had cost the Company less on the average by £101 6s. 8d. This would, of course, swell the profits. In the items which followed—purifying, wages, repairs and maintenance, meters, rents, rates and taxes, management, and bad debts—there was a falling off; the decrease being 3·98d., or a total money saving of £126 0s. 8d., which added to the saving on coal made £227 7s. 4d. The difference in the coal and working expenses were therefore 7·18d. per 1000 cubic feet of gas sold. He deducted the net gas-meter and stove rentals, £67 15s. 4d., which made the comparative increase of gross profit £159 12s. 5d. He had taken the Company's own figure of £865 17s. 10d. as the gross profit. He deducted the £227 7s. 4d. already mentioned; also £2 4s. 4d. for additional repairs and maintenance, to bring the cost to 5d. per 1000 cubic feet; and allowed £126 13s. 4d. for a reduction in price of 4d. per 1000 cubic feet. If the Council supplied gas of 15 instead of 19 candle power, there would have to be this reduction of 4d. These three items made the total deduction of £356 5s.; leaving a net maintainable profit of £509 12s. 10d. The Company charged a high rate for gas; and, with the works in their present condition, 18 years' purchase was very liberal. This gave them £9173 11s., to which he added 10 per cent. for compulsory purchase, £917 7s. 1d.; and the value of the cottages, £400. This made a total of £10,490 18s. 1d. From this he made certain deductions to put the works into serviceable condition. These amounted to £1510; leaving the net value of the undertaking at £8980 18s. 1d., or £1181 7s. per million cubic feet of gas sold. The reduction in the illuminating value of the gas in 1896 acted unduly in the way of inflating the value of the works, unless it was corrected, because the result of supplying gas of a lower illuminating power would be to increase the consumption, as, in order to get the same light, the consumer had to burn more gas. Consequently the consumer had to pay more; and the Company, of course, had a corresponding increase in their profits. He had never heard of a gas-works being purchased at such a high rate as £3000 per million cubic feet. As to the water-works, the Company had a beautiful and plentiful supply. The reservoir was not so large as it should be; and the District Council would either have to enlarge it or divide it into two. As far as the iron was concerned, the water-mains were in good condition. It was difficult to say where the 100 gallons of water supplied per head of the population went to. He had examined the district; and he must honestly say he could not explain it. It was his belief that, having a large supply, the Company would not go to the expense of supervision and inspection. The expenditure that the Company saved by not having the supervision was thrown upon the Local Authority, as they had to deal with every gallon of water that went into the sewers. As to his valuation of the water-works, the present expenditure was not reasonable or maintainable; and therefore he had raised it to 25 per cent.; and this gave him an adjusted gross profit of £422 13s. 9d. Then he made a further deduction of £35 12s., the amount required to be invested annually at 3 per cent. to reproduce the value of the perishable portion of the undertaking in a period of fifty years (which he valued at £4000). This brought the maintainable profit to £387 1s. 9d. He thought the works were worth 22 years' purchase, which gave £8515 18s. 6d. The addition of 10 per cent. for compulsory purchase (£851 11s. 10d.) made £9367 10s. 4d. Taking from this the amount required to purchase the water rights in perpetuity—£1300—brought the net value of the undertaking to £8067 10s. 4d. His joint valuation was therefore £17,048, from which, of course, £2000 had to be deducted if the loans were taken over by the Council.

In cross-examination by Mr. CRIPPS, witness said he had looked at the Company's accounts to see the difference they were paying per ton of coal between the years 1890-94 and 1896; but it did not account for the whole difference of 3·20d. per 1000 cubic feet. As a matter of fact, if he had not dealt fairly with the Company's figures, he should have shown that the price of coal at the present time was higher than in 1892-94. The principal part of the saving in coal had been due to the less quantity of cannel used. He had had two contracts for 1895 and 1896 for thousands of tons of coals; and he had to pay higher prices on the market than in 1892-94. Regarding the water undertaking, and his deduction of 25 per cent. for working expenses as against the actual percentage, witness was asked whether, supposing he found a particular company able to manage their concern under especially favourable conditions, they should not have the advantage of this on a compulsory sale; and he replied that they should if it was done fairly.

Mr. CORBET WOODALL: If this Company only get the price you have put upon their undertaking, and had to reinvest it, would they receive an income equal to that which they now have?

Witness replied in the negative, adding that, he did not think this entered into the valuation of these or any other works. In his opinion, the Company had been taking out of the works in dividend what they should have left in the works for the purpose of saving the deductions which had been made; and in that case the property would have been more valuable. If the Company had not been compelled to sell, they would have gone on taking an undue amount of money out of the pockets of the consumers.

By Mr. WOODALL: He did not believe that either Mr. Woodall or himself would think of putting up a works of this kind with less than fifteen retorts, with the demand now made upon them. At one time, it was usual in works of this size to have a separate hydraulic main to each bed; and, if he were consulted, that would be one of the first things he should arrange for. As to the condenser not being annular, it was true that type was now nearly obsolete in small works. What he intended to convey in his evidence was that the annular condenser, with much less of it, would cool the gas more quickly. In this case 6-inch pipes would be sufficient; but they must have enough of them. He had several gas-engines in use; and although they had a water circulation on the outside of the jacket, still they had to stop every now and then for cooling; and when he was at the Ambleside works, the engine was not running for that very purpose. There was nothing to prevent the Company having every water-fitting in proper order.

By the UMPIRE: For a non-statutory gas company, 24 years' purchase would be the maximum where there was a large margin of works for two or three years; and the minimum would be 16¾ years. In the case of a statutory company, it would be increased to (say) 22 years the minimum, and 28 years the maximum. For a statutory water company, the figures would be 25 to 33 years; for a non-statutory company, 20 to 25 years.

Mr. *J. A. Robertson*, chartered accountant, stated that the details in his and Mr. Lass's accounts were practically the same; but he had a few figures which had not been put in. In 1891, the Company used 515 tons of common coal and 122 tons of cannel and shale—making 637 tons. In 1895, they only used 50 tons of the high-class coal, and 825 tons of the common. In 1896, while their make of gas was much greater than in 1891, 78 tons of cannel and 835 tons of common coal were used. The cannel used in 1896 was very inferior to what was employed before. In the earlier years, the price of coal was about 40s. for cannel and 20s. for common coal. His figures also showed that there had been a great increase in the gas sold on the 4s. 2d. rate; and a diminution in that sold at the higher prices. In 1894, the gas profits were £672 19s.; and he deducted from this £42 18s. 3d. for repairs to the retort-house roof, which had been charged to reserve fund. Then he took repairs and renewals at 6d. per 1000 cubic feet, which came to £84 19s., from which he took the £42 18s. 3d. already deducted. This left £42 0s. 9d. Then he had done a thing which the engineers had not done. As an accountant he did not think it right and proper to multiply the rental of meters (which in 1896 was £81) by 26¾ years, and bring out their value at £2160, against what was admitted by the Company in their accounts as the value of the meters—viz., £265. He took out the rental of the meters each year, less depreciation; leaving £55 12s. 11d. He also deducted £5 16s. from rents of cooking-stoves; and added £75 for increasing the salary of the Manager and Secretary, clerk and collector, and for office rent. These items gave a total deduction of £221 7s. 11d.; making the maintainable profit for the year £451 11s. 1d. In 1895, the maintainable profit worked out to £487 12s. 3d.; in 1896, to £473 3s. 4d. There was only one point in connection with the water undertaking, and that was that the Company charged on the actual rents payable; while he held they should charge on the rateable value. Therefore the rents which the Council would receive would be 13 per cent. less; and he had brought out a difference of about £83 a year.

Mr. CRIPPS: I presume we can charge as we like; we are not a statutory Company.

Witness: The fact is the rateable value is about 15 per cent. less.

Mr. CRIPPS: That is not so.

Mr. BALFOUR BROWNE, in addressing the Umpire, remarked that he had been somewhat staggered to find that the claim made by the Company was at the rate of £17 1s. 6d. for a share which in the market was only worth £7 10s.

Mr. CRIPPS said he was told the shares had been selling for £10.

Mr. BALFOUR BROWNE thought that Mr. Valon's view of the value of the works must commend itself as fair and reasonable.

Mr. CRIPPS having replied,

There was a little discussion as to the date of transfer and the method of dealing with the stocks. It was agreed that the date of transfer should be June 30; that the divisible profits should be added to the award; and that the stocks should be valued separately by an accountant.

As has been previously mentioned, the Umpire's award was given in the "JOURNAL" for the 14th ult. (p. 600).

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending June 30, which, with the accounts for this period, will be presented at the meeting of the proprietors on Thursday:—

The Directors submit the accounts for the half year ended June 30, 1897. The revenue account shows a net profit for the half year of £47,227 8s. 7d. This, added to the amount brought forward from the previous half year, makes £52,279 10s. 5d. Deducting therefrom £4016 5s. 2d. for interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £48,263 5s. 3d. available for dividend. The Directors recommend that dividends be declared at the rates of 13½ per cent. per annum upon the old stock of the Company, and of 10½ per cent. per annum upon the new stock, both less income-tax; and that the difference between the declared dividends and the authorized amount divisible, having regard to the price charged for gas, be carried to the reserve fund. The balance of the net revenue will be carried forward to the next half year.

The accounts accompanying the report consist of the usual statements. They show that stock to the amount of £746,483 has been raised out of the total of £830,000 authorized; and that £196,309 has been borrowed out of £300,000 sanctioned. The receipts on capital account are £942,792 (£62,792 raised in the half year), of which sum £933,028 has been expended; leaving a balance of £9764. The expenditure on capital account in the past six months (£24,582) comprised £13,437 for new and additional buildings, plant, &c.; £3673 for new mains; £590 for meters; £1561 for stoves and fittings; and £5158 for

"coin" meters and fittings, less £1128 written off for depreciation. The reserve fund amounted to £43,374 and the insurance fund to £28,652 on June 30. The balance-sheet shows that the value of the stores on hand at the close of the half year was as follows: Coals, £24,618; coke and breeze, £5631; tar, ammoniacal liquor, and sulphate of ammonia, £8107; sundries, £11,214—total, £49,570. The revenue and profit and loss accounts, together with the statements relating to the working, are given below.

REVENUE ACCOUNT.

To Manufacture of gas—				By Sale of gas—			
Coals, including dues, carriage, unloading, and trimming	£72,011	9	0	Common gas, per meter, at 2s. 6d. per 1000 cubic feet	£138,619	19	5
Salaries of Engineer and Officers at works	2,238	10	0	Public lighting and under contracts, common gas	9,786	15	3
Wages (carbonizing)	21,126	4	3				£148,386 14 8
Purification, including £2138 0s. 9d. for labour	4,398	18	9	Rental—			
Repair and maintenance of works and plant, materials and labour (less £334 2s. 3d. received for old materials)	16,731	4	11	Meters	£2,269	12	2
			£116,389 6 11	Stoves	1,119	1	2
Distribution of gas—				Coin meters and fittings	1,534	8	4
Salaries and wages of Officers (including Rental Clerks)	£1,617	16	7				4,923 1 8
Repair, maintenance, and renewal of mains and service-pipes, including labour	3,053	2	3	Residual products—			
Repair and renewal of meters	1,711	4	3	Coke, less £4704 18s. 9d. for labour	£21,624	18	8
" " stoves	1,382	9	4	Breeze, less £1009 12s. 9d. for do.	77	8	6
" coin meters and fittings	1,128	15	2	Tar	7,150	13	10
			8,896 7 7	Ammoniacal liquor and sulphate of ammonia	5,820	1	4
Public lamps—Lighting and repairing			2,590 10 9				31,673 2 4
Rents, rates, and taxes			7,089 11 8	Miscellaneous receipts—			
Management—				Rents receivable	£279	7	8
Directors' allowance	£1,250	0	0	Transfer fees	24	15	0
Company's Auditors	75	0	0				294 2 8
Salaries of Secretary, Accountant, and Clerks	1,103	4	11				
Collectors' salaries and commission	1,467	16	3				
Coin Meter Collection	185	19	11				
Stationery and printing	540	19	2				
General charges	447	8	2				
			5,075 8 5				
Bad debts			592 11 6				
Law charges			154 3 5				
Superannuation			188 0 0				
Official Officers			131 12 6				
			£141,049 12 9				
Balance carried to net revenue account			47,227 8 7				
			£188,277 1 4				£188,277 1 4

PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£3,712	10	0	Balance, Dec. 31, 1896	£51,723	6	10
Balance of interest on temporary loans	303	15	2	Less—Amount of dividend paid for half year ending Dec. 31, 1896, £45,787 10s., and £993 15s., available for dividend, carried to reserve	46,631	5	0
Balance available for dividend	48,263	5	3		£5,092	1	10
				Balance from revenue account	47,227	8	7
	£52,279	10	5		£52,279	10	5

STATEMENT OF GAS MADE, SOLD, ETC.

Quantity Made. Meter Register.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
1,264,131	61,[illegible]5	1,109,262	1,187,463	5,603

STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1896.	Received during the Half Year.	Carbonized during the Half Year.	Used and Sold during the Half Year.	In Store, June 30, 1897.
	Tons. Cwt.	Tons. Cwt.	Tons. Cwt.	Tons. Cwt	Tons.
Common	25,728 13	115,556 10	117,139 13	415 10	23,730
Cannel	12,068 0	1,051 10	3,781 10*	—	9,338
	37,796 13	116,608 0	120,921 3	415 10	33,068

* 67,476 gallons of petroleum spirit used as a substitute for cannel.

STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1896.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, June 30, 1897.
Coke—tons	9,350	73,212	20,40[illegible]	52,330	9,832
Breeze—chaldrons	3,550	10,448	—	10,678	3,320
Tar—gallons	375,430	1,270,627	—	1,362,017	284,040
Ammon. liq.—butts of 108 gals.	11,163	41,370	40,025	—	12,508
Sulphate of ammonia—tons	1,950½	1,227	—	2,763	414½

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday—Mr. J. R. WIGHAM, J.P., in the absence, through illness of Mr. E. Fottrell, the Chairman, presiding.

The SECRETARY and MANAGER (Mr. W. F. Cotton, J.P.) having read the notice convening the meeting, the report and accounts, which were dealt with in the "JOURNAL" last week, were presented.

The CHAIRMAN, in moving the adoption of the report, expressed his regret, in which he was sure the shareholders all joined, at the absence of Mr. Fottrell, whose zeal and attention to the Company's affairs could not be surpassed. Proceeding to deal with the position of the undertaking, he said it was prosperous; and they had reason to be proud of it. During the past half year, the sale of gas had increased by 35 million cubic feet as compared with the corresponding period of 1896; giving an additional rental of £6200. This would have enabled the Directors to pay the usual dividends without resorting to the reserve fund had it not been for the depression in the value of residuals. The item of tar alone showed a decrease of £1820. But for this and a few other smaller items, there would have been no occasion to take from the reserve fund £2050, to keep up the dividends. He had no doubt, however, that the depression he had alluded to would not long continue, and that they might look forward to as good results as they had had in previous years. He was glad to say there had been an increase in the number of consumers, mainly arising from an extended use of "penny-in-the-slot" meters. They now had 1235 of these in use. At first, they did not "take on;" many houses not being fitted for the use of gas, and the poor people who inhabited them being disinclined to incur expense for fittings—as they said, doing the work for their landlords. It might be advisable for the Board on some future day to consider whether it would not be well to do something to meet the want by supplying, or helping to supply, gas-fittings to those who were not in affluent circumstances. It was satisfactory to know that the use of gas for cooking and heating purposes was also increasing; and it became very difficult for the officials to keep pace with all the orders received. It was with much satisfaction that he was able to announce that the Company's relations with the Corporation were much less strained than before; and they hoped that presently they would be enabled to get on very comfortably with that great body. The meters for the public street-lamps, about which there had been much controversy, were now nearly all put in; and when the work was completed, the gas consumption would be regulated in a manner which, he believed, would do away with all friction and unpleasantness in the future. In truth, the interests of the Corporation and of the citizens were bound up with the Company in a larger degree than at first sight might appear. Injury done to the Company reacted upon the citizens. If, through injustice or unfairness, the Company had to raise the price of gas, all parties suffered; on the other hand, by the fair treatment which they thought they were entitled to, the charge might be reduced—doing good in that way to the community, and especially to the gas consumers. There was only one other matter he had to notice—viz., the increased illuminating power of gas obtained by the incandescent system. Of course, it was impossible to use the incandescent burner in all cases; but in places where superior illumination was needed with increased intensity, and where the light was not liable to be moved about, nothing better than the incandescent burner could be used; and the Company viewed with pleasure the extension of a system which he thought was destined to effect a revolution in lighting by gas.

Mr. D. DRUMMOND, J.P., seconded the motion; and it was carried unanimously.

The dividends recommended in the report—at the rate of 10½ and 7½ per cent. per annum—were then declared.

Thanks were accorded to the Directors, as well as to Mr. Cotton and his staff, for their services to the Company; and the proceedings closed.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the London Offices, 11, George Yard, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, as well as the report of the Directors for the six months ending June 30. The latter stated that the balance of profit was £22,227, after deducting the following items, and adding £146 and £112 respectively from the Hull and Trowbridge reserve funds; the parliamentary interest at those stations not having been realized by these amounts. The deductions were: Income-tax, £864; Potteries excess profit, £961; Norwich debenture interest, £593; Potteries debenture interest, £386—making a total of £2806. The gas-rental at the Hull station showed an increase of £2975, as compared with that of the corresponding half of

1896; the price of gas having been the same at each period. Coke and tar were about the same. Tar distilling, ammoniacal liquor, and sulphate of ammonia showed a small increase (£18). Coal cost 9s. 11d. per ton, as against 10s. per ton. Coke realized 8s. 1d. per ton, as compared with 8s. 9d. The quantity of gas sent out was 406,031,610 cubic feet, as against 379,563,315 cubic feet, or an increase of 26,468,295 cubic feet. After taking the before-mentioned £146 from the reserve fund, a balance of £34,540 remained. The gas-rental at the Norwich station showed a decrease of £639, compared with that of the corresponding period of 1896; the price of gas having been the same—viz., 3s. 6d. per 1000 cubic feet, with the usual discounts. The sum realized for coke, tar, and ammoniacal liquor exhibited a decrease of £467. Coal cost 15s. 11d. per ton, as against 15s. 1d. Coke realized 6s. 1d. per chaldron, as compared with 5s. 8d. The quantity of gas sent out was 149,855,000 cubic feet, as against 155,549,000 feet, or a decrease of 5,694,000 feet. The profit realized was £2892 less than the parliamentary interest allowed. The deficiency in the stock of coal at this station alluded to by the Chairman at the last meeting had been ascertained to be of the value of £865, one-half of which had been written off in the past half year; leaving the remainder to be charged against the current half year. The gas-rental at the Potteries station showed an increase of £1475; the price of gas having been the same as in the corresponding period of 1896—viz., 2s. 3d. per 1000 cubic feet. The sum realized for coke, tar, and ammoniacal liquor represented an increase of £463; while sulphate of ammonia showed a decrease of £31. Coal cost 8s. per ton, as against 8s. 5d. Coke realized 4s. 9d. per ton, as against 4s. 4d. The quantity of gas sent out was 151,046,000 cubic feet, as compared with 140,807,600 feet; showing an increase of 10,238,400 feet. The profit realized was £961 in excess of the parliamentary interest allowed. This sum had been invested in Consols; making the reserve fund at this station £15,076. The gas-rental at the Trowbridge station had increased by £85; the price of gas having been the same in each period—viz., 3s. 2d. per 1000 cubic feet, with discounts. The residual products had realized rather more (£15) than in the corresponding period of 1896. Coal cost 13s. 3d. per ton, as against 13s. 5d. Coke had realized 6s. 10d. per chaldron, as against 6s. 1d. The quantity of gas sent out was 22,147,000 cubic feet, as against 21,621,395 feet, or an increase of a little more than half a million cubic feet. The profit was £112 less than the parliamentary interest. This would be taken from the reserve fund, and leave a balance of £3228 to the credit of the account. The gas-rental of the Holywell station was slightly lower than at the corresponding period of 1896; and the residual products also showed a slight decrease. The profit realized was £301. Summing up the general financial result of the half-year's working, the Directors said the profit, added to the previous balance standing to the credit of profit and loss, amounted to £48,996. From this they recommended a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both clear of income-tax. The dividend and bonus would amount to £23,625, and leave a balance of £25,371.

The Chairman, in moving the adoption of the report and accounts, said the half year had been a fairly prosperous one, except as regards the Norwich station. Regarding Hull, which was their most important station, the capital outlay during the six months had been, roughly speaking, about £10,000. This sum had been mainly spent in the erection of a large retort-house, and fitting it up with charging and drawing machinery and Winstanley's regenerative furnaces. The house was not yet in action; but they hoped to have it partially so next month, and almost entirely during the winter. The accounts for this station came out extremely favourably, because they only showed a deficiency of £146, notwithstanding that the new retort-house had not been earning its proper proportion of profits. When they had it in full working, he had no doubt they would see a different result. The shareholders would remember that, when he last addressed them, he stated that the Corporation of Hull had promoted a Bill to give them power to buy the Kingston-upon-Hull Gas-Works—that was to say, the works on the small island at Hull which represented the business portion of the town surrounded by the docks. The Bill had been passed, subject to a Local Government Board inquiry, which, he believed, would take place in November. Until then, they were unable to proceed with the negotiations with the Corporation for the supply of gas in bulk for the lighting of that district, in accordance with the powers obtained by them in the Bill. With reference to the Potteries station, it would be noticed that they had there a surplus of £961, which was a large balance, considering the state of the residuals market, and especially the low price of coke in the district. The increase in the gas sold there had been 7 per cent.; and if the advance continued as it had been doing for some time past, it would necessitate, at no considerable distance of time, a large addition to the plant at that station. The Company were working very amicably with all the Local Authorities in the Potteries district. It would be within the recollection of the shareholders that, on the occasion of the Company having a Bill before Parliament for that station, a local Auditor was forced upon them. He presumed, however, the Local Authorities had great confidence in them, because the Auditor had not taken any action in regard to an examination of the accounts. It was possible the Company might have to make a reduction in the price of gas there. The present rate was very low for the district—2s. 3d. per 1000 cubic feet; and 1d. reduction would absorb £1100 per annum. They had not given notice of a reduction yet; and the Directors would have to consider whether they should not come down to 2s. 2d. At Norwich, they had not earned the parliamentary interest by more than £2000; and this station now owed the parent Company a sum of about £8000. A water-gas plant had been erected there, in order to meet the wishes of the town for an increased illuminating power. This plant was put in operation the first week in August; but he could not say everything was going quite smoothly at present. In starting new works, there were many things to be got over; and there had been a few complaints as to smell, and so on. But they hoped, with a little management and care on the part of those in charge, to overcome this. There was no doubt it would be in the future a source of considerable saving to the Company—in fact, the Manager had assured him the saving would be nearly 3d. per 1000 cubic feet, taking everything into account. The deficit in the stock of coal had worked out to about £860; and he need hardly say that the Manager was severely reprimanded about this matter when it was found out. The Directors proposed to divide the amount between two half years; and therefore £432 had been charged against the present accounts. The electric light was going ahead in Norwich. He thought this was owing to the high price of gas; and if they could get it down to 3s., it would be a great benefit to the Company. The Directors were using every effort to effect savings, and to see whether they could not reduce the price. They were all in favour of cheap gas, as was shown by their action at Hull and the Potteries. But Norwich was an exceptional place. Coal was dear there, and coke cheap; and there was not that business done as in places like Hull and the Potteries. It was a stagnant sort of country town, although it was the capital of the county. Everything was going on well at the two small stations—Trowbridge and Holywell. The Directors were about to consider whether they could not restore the retort-house at the former station. They had been putting it off from time to time, as they did not think the place was doing well enough to necessitate a large expenditure. Something would have to be done; and they would probably take the work in hand next spring.

Mr. F. Wilkin seconded the motion, which was at once unanimously adopted.

On the motion of the Chairman, seconded by Mr. Corbet Woodall, the dividend and bonus recommended in the report were declared.

The retiring Directors (Colonel Wilkinson and Major-General W. T. Corrie) and the Auditor (Mr. E. Knowles Corrie) were re-elected.

On the proposition of Mr. R. Hesketh Jones, seconded by Mr. R. S. Gardiner, the thanks of the shareholders were accorded the Chairman and Directors for their exertions on behalf of the Company.

A similar vote was also passed to the Secretary and officers; the Chairman, in proposing it, remarking upon the readiness with which Mr. Chamberlain had mastered the duties of his new office.

GAS SHAREHOLDERS AND THE VOTING UPON ELECTRIC LIGHTING QUESTIONS.

In previous numbers of the "Journal," references have been made to the above subject, which comes forward from time to time when the question of adopting the electric light is under discussion by local authorities. In our issue for Dec. 10, 1895, we printed the opinions given by several eminent Counsel on the point raised; and we are now able to supplement them by that of Mr. A. Macmorran, Q.C., which was obtained by the Town Clerk of Canterbury (Mr. H. Fielding) when the electric lighting scheme for that city was under consideration, and recently published by our contemporary "Lightning." The questions submitted to the learned Counsel, and his opinion, were as follows:—

Questions.

Can members of the Council having shares in their own right in a local Gas Company which now supplies gas to the Corporation for the purpose of lighting the town: (1) Either vote or discuss in Council or Committee (*a*) the employment of Counsel at a Local Government Board inquiry as to the raising of a loan for the purpose of lighting the town with electric light, or (*b*) the holding or postponement of the said inquiry? (2) Would such resolutions, carried by means of such members voting improperly, be valid? (3) What is the duty of the Mayor when any councillor does so improperly vote?

Opinion.

Every shareholder in the Gas Company has a share or interest in the contract between the Corporation and the Company for public lighting. This is clear from *Todd v. Robinson* (14 Q.B.D., 739). The decision I have referred to shows that such a contract on the part of a shareholder would disqualify him from being elected or being a member of the Council but for the express provision in sec. 12 (2) [d.] of the Municipal Corporations Act, 1882. That provision enables a shareholder in the Company to be elected, and to be a member of the Council, notwithstanding his interest in the contract; but it only removes his disqualification to that extent. He has still a pecuniary interest in the contract, and he is forbidden by sec. 22 (3) to vote or take part in the discussion of anything which may directly or indirectly affect that pecuniary interest.

The question whether the contract with the Gas Company is a pecuniary interest, such as would prevent a shareholder from voting on resolutions for or against the obtaining a Provisional Order for electric lighting, has never been the subject of express decision, but the preponderance of opinion is to the effect that it is; and I myself have on other occasions adopted this view. The introduction of a rival system of lighting for public and private purposes must, in my judgment, be regarded as affecting the pecuniary interest of the Gas Company and of every shareholder in that Company.

The shareholders in the Gas Company have the same interest in postponing the introduction of electric lighting or of defeating the scheme, by not bringing the application for a loan properly before the Local Government Board, as they had in seeking to reject the resolutions to apply for a Provisional Order; and I am therefore of opinion that councillors who are such shareholders cannot vote on, or discuss in Council, questions relating to the employment of Counsel or the postponement of the inquiry. A resolution which was carried by the votes of councillors prohibited from voting by sec. 22 (3) would be invalid.

The duty of the Mayor is to reject the votes of the councillors who are shareholders, even if they are tendered; but the result should be recorded in this way: "That there voted for the resolution A, B, C, &c., and against it D, E, F, &c., but that, as A and B were not qualified to vote, as having a pecuniary interest in the matter under discussion, their votes were not counted."

Brisbane Gas Company.—The report of the Directors of this Company for the six months ending June 30 shows a net profit, including the balance brought forward, of £7888. They recommend a dividend of 4½ per cent., amounting to £6295, the tax on which comes to £315—together, £6610. This will leave £1278 to be carried forward. The sale of gas in the above-named period produced a revenue of £17,585, of which manufacturing expenses, depreciation, &c., absorbed £10,082.

LEICESTER CORPORATION GAS, ELECTRICITY, AND WATER ACCOUNTS.

At the Meeting of the Leicester Town Council last Tuesday, the Committees in charge of the Gas, Electric Lighting, and Water Departments submitted their accounts for the half year ending June 30.

The Gas Committee reported that the net profit, after paying interest on the capital of the undertaking, was £13,274. Out of this had been paid £3253; being the half-year's amount of the sinking fund, which left a balance of £10,021 to be applied at the end of the financial year, March 31 next, as the Council might direct.

Alderman LENNARD, in moving the adoption of the report, remarked that he wanted to assure the Council that they had never had better value for their capital account in the department than they possessed that day. It had been deemed necessary to spend a considerable amount of money in the Gas Department; and this year he thought they would lay out some £70,000 or £80,000. When it was remembered that the department had grown 20 per cent. within the last three years, it would be seen how necessary it was to provide for the extensions which was still going on. Turning to the revenue account for the half year, he said the total receipts amounted to £94,346—an increase of £6588 over the corresponding half of 1896; while the total expenditure was £67,320. The increase in the receipts was larger than the increase in the expenditure. The first half year had done its share towards realizing the estimates of the Finance Committee; and he fully believed the remaining half would do likewise. The Committee and the Engineer (Mr. A. Colson, M.Inst.C.E.) had every confidence in asking the Council to confirm the general financial statement.

The report was adopted.

The Committee also reported that the accounts of the Electric Lighting Department showed a loss (after charging £582 on sinking fund account, and after taking credit for £183 profit on the fitting business) of £216. This, together with £1603 loss to Dec. 31 last, made a total loss in connection with this department of £1819. The total amount which had been paid on account of the sinking fund was £3043.

Alderman LENNARD said the expenditure in this department had gone up about 10½ per cent.; while the output had increased by 75 per cent. This was the first account presented at the reduced charge. The foreshadowing statement that in three years' time the expenditure and revenue would balance, and no loss would have then been sustained, would, he believed, be about realized. They were continuing to double their output; and the Committee quite anticipated that this half year they would have a net profit of £1300 or £1400, which would nearly wipe out the loss standing in the balance-sheet, and had it not been for the reduction of 1d., they would have had a handsome balance in hand at the end of the third year's working. The present station was being worked to its full capacity; and the demand was so great that they were not likely to take any fresh customers this side of Christmas.

Mr. ROWLETT, while supporting the Committee generally, wished to advert to the striking off their books of the name of a large firm of gas-meter manufacturers with whom the Corporation had formerly done business, and who had supplied meters to the gas-works ever since they were established. It was alleged that the firm in question declined to employ Trade Union labour; but he could assure the Council that they were the only firm in the district who worked 48 hours a week. He read a letter forwarded to the firm on the matter, and alleged that, in consequence of the cessation of business with them, the ratepayers sustained considerable loss, as the firm was unsurpassed in the manufacture of meters; being able to do so 17½ per cent. cheaper than other manufacturers—not because they sweated their workpeople, but because they were in a better position to do work than others.

Mr. H. H. WOOLLEY said the matter had already been discussed very fully in Committee, and, with the exception of Mr. Rowlett's vote, they were unanimous.

Alderman LENNARD also defended the Committee against Mr. Rowlett's criticism, and asserted that they had gone fully into the question. He did not agree that such a loss as Mr. Rowlett suggested would be incurred through the Committee's action. He particularly resented that gentleman's statement that the Gas Committee were dominated by the labour members. It would have been a pleasure to the whole of the Committee to have kept the firm in question on their books; but their business notions were so antiquated that the Committee felt they could not do so.

The report was passed.

The Water Committee reported that their accounts showed a net profit, after paying interest on the capital, of £3883. Out of this had been paid £2803, the amount of the half-year's sinking fund; leaving a net balance of £1080 to be dealt with at the close of the current financial year, in accordance with the provisions of the Transfer Act.

Alderman WOOD moved the adoption of the report. He remarked that they had spent in the last half year a little over £40,000 upon the Swithland and other works; bringing their capital expenditure up to £810,000 odd. He was glad to say that he believed their profits would now steadily increase for some years to come. The water undertaking generally was in a satisfactory condition; and the new works were answering all expectations.

The report was adopted.

Suffocation by Gas.—According to a telegram from Dalziel's New York correspondent, a woman and four children, who arrived at a small hotel on the west side of the city last Thursday night, and engaged a room, were all found dead on the following morning. Every crack and the keyhole had been carefully stopped up, and the gas-jet turned full on. These facts point to a case of murder and suicide.

Reductions in Price.—The Annan Gas Company have reduced the price of gas from 3s. 8d. to 3s. 4d. per 1000 cubic feet. The Police Comissioners of the burgh have asked for a further reduction for the gas consumed in the public lamps, on the ground that they give the Company facilities for the breaking up of the streets without charge. The Bervie, Kincardineshire, Gas Company have reduced the price of gas from 8s. 9d. to 8s. 4d. per 1000 cubic feet.

THE VIENNA MUNICIPALITY AND THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

Our readers are aware that the "Financial News" has consistently opposed the policy of the anti-Semitic party at present in power in the Vienna Municipality in regard to the Imperial Continental Gas Association and the supply of gas in the city. The Burgomaster (Dr. Lueger), as the leader of the hostile movement, has necessarily come in for a large amount of criticism; but he has found a champion in a correspondent of the "Westminster Gazette." Our financial contemporary, in an article which appeared last Wednesday, dealt as follows with the Burgomaster and his defender:—

About ten or fifteen years ago, it became a craze of the "young historical" school to try to whitewash everybody who hitherto had been considered a monster or a criminal of the deepest dye. They tried this process with Nero and Caligula, with Torquemada and Judge Jeffreys, with Titus Oates and Guy Fawkes; and now the latest candidate for whitewash is Dr. Carl Lueger, the anti-Semitic Burgomaster of Vienna. A correspondent of the "Westminster Gazette" has had the temerity to undertake this task, but hardly with greater success than the champions of Nero or of Titus Oates. The defender of Dr. Lueger says that he had an interview with the Burgomaster, on which occasion Dr. Lueger was very careful to explain "that the Municipal Council, in deciding to have an entirely new system of lighting, was not actuated by any dislike of the English. The Gas Company, he said emphatically, is not English, but Jewish." It is evident that the "Westminster Gazette" correspondent must be quite a stranger in Vienna, as even Dr. Lueger would not have had the hardihood to make such a statement, which is the very opposite of the truth. "Not actuated by any dislike to the English!" On every occasion during the last five years, whenever the question of the Gas Company was discussed, either in the Gemeinderath (Town Council) or at any other public meeting, Dr. Lueger as well as the other leaders of the anti-Semitic party have vehemently and passionately inveighed against the Company as an English Company, against the English people, against the English national character, and against anything and everything connected with England and the English. "The English people," cried Dr. Lueger at a well-remembered meeting, "are the Jews of the West of Europe" (*Die Englaender sind die Juden von West Europa*); and what this phrase meant from the lips of the present Burgomaster of Vienna need not be explained. "The Jews must be expelled—they must be exterminated; no Jew deserves to live." Such words, and many more atrocious ones, were, and still are, stock phrases of the anti-Semitic head of the Vienna Town Council and his party.

It is quite clear why Dr. Lueger, in his interview with the correspondent of the "Westminster Gazette," was "so very anxious" to explain that the Municipal Council, in dealing with the Gas Company question, was not actuated by any dislike of the English. The new system of lighting Vienna will cost many millions of florins. The new anti-Semitic policy of the Council and of Dr. Lueger, its official head, requires a loan of over 60,000,000 kronen (upwards of £2,500,000 sterling for one object alone. Dr. Lueger tried to get money in Vienna, in Berlin, in Brussels, and in Paris; but all in vain. Wherever his agents knocked at the doors of the leading banks, they received the answer that people there had not yet forgotten the former results of a special "catholic" financial policy of the anti-Semitic financial crusade, and loans of Langrand Dumonceau and Bontoux; that their clients had thereby lost milliards of francs; and that no proposal to do business with Dr. Lueger on the basis of his principles could be entertained. It then occurred to Dr. Lueger that *pecunia non olet*; and though the English be the Jews of Western Europe, yet their money is not to be despised. He therefore commissioned some agents to try their luck in the City of London. Surely, in London, "the greatest city in the world," as even the Burgomaster of Vienna, in his interview with the correspondent of the "Westminster Gazette," graciously acknowledged, the money which he wanted for the purpose of expelling and exterminating the other Jews of Eastern Europe could be obtained. For this reason Dr. Lueger was "very careful" to explain to the Englishman that neither he nor the Town Council was actuated by any dislike to the English in their policy concerning the new lighting of Vienna and with respect to the English Gas Company. The astute Burgomaster put his anti-Anglicism (which, according to his own previous declaration, is synonymous with anti-Semitism *ad hoc*) aside—stowed it away in his deepest pocket and said even "he hoped to be able to visit London next year." All this with the view of getting a loan of about £3,000,000 sterling in the City for the purpose of defrauding and destroying the English Gas Company in Vienna, and setting up a new anti-English, anti-Semitic lighting company in its stead!

ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Liverpool City Council last Thursday authorized an extension of the electricity distribution system at a cost of £2500.

At the last meeting of the Peterborough City Council, a resolution passed on the 30th of March, by which the further consideration of the subject of electric lighting was deferred for twelve months, was rescinded, and it was decided to apply to the Board of Trade for an extension of the time specified in the Council's Provisional Order.

After some negotiation, the Gravesend Town Council, through their Paving, Lighting, and Works Committee, have arrived at terms with Messrs. Crompton and Co. and the Electric Supply Corporation (with whom the former are associated) for the introduction of the electric light into the borough. The Company have offered to supply the Council with current at 3d. per unit if they will light the whole or the greater portion of the streets with it.

About a year ago the Eccles Corporation sought borrowing powers for carrying out an electric-lighting scheme at a cost of £18,000; but at the Local Government inquiry, the opposition was so strenuous that sanction was not given. The Provisional Order was, however, extended twelve months. In the meantime, a modified scheme was prepared; and the Town Council thereupon sought borrowing powers for £11,408. As the

result of the inquiry a short time ago, information has been received by the Town Clerk that the amount asked for would be sanctioned; the period of repayment being fixed at twenty-five years.

The Local Government Board have sanctioned the borrowing of £14,880 by the Hanley Town Council for electric lighting purposes. The current is to be supplied on the "maximum demand" system; 2½d. per unit to be charged on the extra consumption.

Reference was made in our "Notes" last week to the defective condition of the electric light cables in Dublin, and to the necessity for the expenditure of a considerable amount upon them in order to prevent recurrences of the breakdowns which have been recorded from time to time. As if to stimulate the Corporation to prompt action, the cables failed again on Monday night last week, with the result that on one side of D'Olier Street, Westmoreland Street, College Street, Grafton Street, Dame Street, and Parliament Street—the most important thoroughfares in the city—the electric light was conspicuous by its absence. If it had been the gas of the Alliance Company which thus failed the citizens, what a scene there would have been at the next Corporation meeting.

The new electricity supply works which have been erected for the Hammersmith Vestry were formally brought into operation last Thursday. The current, which will be distributed on the high-pressure alternating system, is generated at the central supply station in Fulham Palace Road at a pressure of 2000 volts, and distributed to six substations, where it is transformed to a low-pressure current of 110 volts. There are in all four dynamos—three of the Ferranti disc type, and one of Ferranti's revolving field magnet type. The lighting of the main thoroughfares is by Brockie-Pell arc lamps, placed from 70 to 110 yards apart; and they are reckoned to be of about 1200-candle power each. Fixed on the same standards are two incandescent lamps of 32-candle power, which are intended for use after midnight, and are automatically lighted. Private consumers have their choice between two scales of charges. They may either pay 6d. per unit for two hours' maximum demand, and 4d. for each unit additional, or 2½d. per unit, with an additional fixed charge of 1s. 3d. a quarter for each lamp demanded. The total cost of the installation has amounted to about £40,000.

The Islington Vestry applied to the London County Council a short time ago for a loan of £7000 for electric lighting purposes; and the Engineer of the Council reported that, in his opinion, the works for which the loan was required might have been effectively carried out at less cost. The Vestry's Engineer has assumed that the criticism refers to the whole undertaking, as the loan only formed part of the initial expenditure; and he accordingly prepared a long report on the subject, which came before the Vestry last Friday. He stated that, in designing the installation, he had always kept in mind the following points: Continuity of supply, provision for future extension, safety to life and property, facilities for supervision and testing, limitation in cost, both of production and of repairs and maintenance. After dealing with the difficulties which the Electric Lighting Committee had to meet with regard to site, the durable and substantial character of the buildings and machinery, &c., he stated as follows: "The expenditure authorized by the Vestry up to date (including the immediate extensions) amounts to about £150,000; and, assuming that, up to the end of 1898, a further sum of £40,000 for extension of mains, &c., is authorized (which, I think, should be an outside figure), the total expenditure to that date will amount to £190,000, and this divided by 1160, being the total kilowatt capacity of the plant when the extensions included in this sum are complete, will reduce the capital cost per kilowatt from £204 to £163, or only £13 above the average. The fact that the cost falls to the extent of £41 per kilowatt on the first extension proves that the high initial expenditure is not due to extravagance, but chiefly to provision having been made for the future, for it is not at all uncommon to find the capital cost per kilowatt rise materially as extensions take place. At Islington, every extension of machinery will tend to reduce, rather than increase, this figure." He said his opinion was that in five years the capital cost per kilowatt would not exceed that of other installations in London of similar size; while the general excellence of the installation could not be disputed.

In another column will be found a statement respecting the financial results of the working of the Leicester Corporation Electricity Department during the past half year; and it will also be noticed, in the statement of Alderman Lennard, that the demand for electricity is approaching the capacity of the works. In order to make provision for an extended business, the Corporation recently applied to the Local Government Board for their consent to the borrowing of an additional £33,719; and, consequently, an inquiry was held last Tuesday by Colonel W. L. Coke, M.Inst.C.E. The Town Clerk (Mr. J. Bell) explained the position of affairs, and that it had been decided to carry out certain works at an estimated cost of £30,193. In addition to this sum, they had overspent up to March last £1253 for sub-stations and transformers, and £2273 for mains and services; but the actual amount overspent under these heads up to June was £4051. The capacity of the present central station was equal to 675 kilowatts; the generating plant consisting of four direct-driven Mondey-Victoria alternators—three being of 200 kilowatt capacity each; and one, a day-load plant, of 75 kilowatts. At present there were only two high tension trunk cables into the town, each equal to 300 kilowatts. The demand for electricity since the opening of the station in December, 1894, had been of so satisfactory a character that even last winter the load reached over 90 per cent. of the practical working capacity of the station. The Engineer (Mr. Alfred Colson) recommended the erection of four 350 kilowatt alternators in substitution of the present three 200 kilowatt and one 75 kilowatt alternators. In three cases, the present engines would be ample for this size machine; but a fourth engine corresponding to these would be needed, as also additional boiler power, &c. The substitution of these large alternators for the present machines, and the added boiler power, &c., would increase the productive capacity of the station, without any enlargement of buildings, from 675 kilowatts to 1400 kilowatts. The Engineer also recommended the laying of two additional trunk cables into the town of equal capacity to the present ones; making four in all, with a total capacity of 1200 kilowatts. An extension of both high and low tension distributing cables was also required with the necessary sub-stations and transformers.

The promised interim balance-sheet of the Electric Lighting Department of the St. Pancras Vestry was presented at last Wednesday's meeting of the Vestry. Mr. H. J. Menzies, the Chairman of the Department, thought it most creditable to all concerned, for it showed a gross profit for the six months covered by it of £5356 18s. 7d. for the two stations—£5063 2s. 8d. from the Regent's Park and £293 15s. 11d. from the King's Road station. These figures show an increase of more than 15 per cent. per annum, the King's Road station, according to the report, being in a particularly satisfactory condition, inasmuch as a loss of £847 was made on last year's working. Up to this point, the report was very pleasant reading to the electric light converts; but its gilt is somewhat tarnished when it is stated that "the net result of the six months' trading, after meeting all payments of instalments of loans and interest, is a profit on the Regent's Park station of £2040 2s. 9d., and a loss on the King's Road station of £739 15s. 9d., to which is added the deficit of £800 12s. 7d. at December last; leaving a profit balance carried forward on account of both stations of £499 14s. 5d." Of course, Mr. Menzies could not but be hugely delighted at such phenomenal progress; and Mr. Challen may appear to have been justified in his eulogy of the Chairman and all his works. But it is well to point out to the curious that this wonderful net profit of £499 is brought about by a capital expenditure of more than £190,000, or something like 10s. per cent. per annum. The utterly ridiculous sum of £57 2s. 11d. is allowed "for reduced value of tools, &c."—presumably not including machinery. There seems, too, to be a lack of ready cash in this ever-spending department, for the cash in hand is only placed at £70 17s. 10d. No less a sum than £35,136 is owing to the bankers, and £162,485 to the London County Council and others. The arc lamps for street lighting bring in a nice little revenue of £1744 15s. Naturally, the peculiar financial conditions of the department necessitate a large expenditure for interest on loans; and £2719 13s. 1d. was paid for this purpose, and £1250 8s. 7d. was set aside as instalments paid off loans. It will be seen, therefore, that the department is severely handicapped by its ever-increasing debt—a debt that would prevent even the inception of any ordinary commercial concern of like nature. But the ratepayers and their rates are the backbone of the whole undertaking; and it is on them that the lenders rely.

EAST LONDON WATER-WORKS COMPANY.

Half-Yearly Report and Accounts.

The report of the Directors of the East London Water-Works Company, with the accounts for the six months ending the 24th of June, has been issued in view of the half-yearly meeting of shareholders next Thursday. The revenue from all sources amounted to £158,035, as compared with £153,459 in the corresponding period of the previous year; being an increase of £4576. The expenditure (including £922 paid to the Chamberlain of London) was £68,171, against £77,826 before, when the Chamberlain received £1140; showing a decrease of £9655. Referring to these figures in their report, the Directors remark that the substantial increase in the revenue—the largest reached in any Midsummer half year for the past ten years, except in 1891—is satisfactory; while the great decrease in the expenditure shows that the undertaking has recovered from the prejudicial effects of the recent adverse seasons. Dealing with the position of the Company's works, the Directors state that by the enlargement of the Racecourse and the completion of the East Warwick reservoir an additional quantity of 400 million gallons of water was stored early in the year. The latter reservoir is now being filled; thus completing the important additional works which were sanctioned by Parliament in 1894, and which the Committee before whom the Company's Bill was considered urged should be pushed forward with all expedition. A period of seven years was allowed for the completion of these works; but all will have been finished and in use within three years—a result which the Directors feel will be highly satisfactory alike to Parliament, the public, and the proprietors. With regard to the extent of the Company's operations, 2968 new services were laid on in the past half year, as compared with 2659 in the corresponding period of 1896; the total number now in use being 190,079. As to the quality of the supply, the Directors remark that the reports of Sir E. Frankland as well as those of Sir W. Crookes and Professor Dewar continue to show that the Company's water is efficiently filtered and of a high standard of purity. Passing on to deal with the parliamentary business of the past session, the Directors remind the shareholders that the Bill promoted by the Company to enable them to extend their works and raise further capital was read a second time in the House of Commons on the 26th of February, went in due course before a Committee, as reported at the general meeting in April, and, although opposed on several grounds was passed with but few amendments, and received the Royal Assent on the 6th of August. This measure will further consolidate the position of the Company; and when the contemplated works are completed, the available supply will not only be a security against severe droughts, but will enable the Directors to meet the requirements of an increasing population for years to come. The Government introduced and carried the Metropolis Water Bill, which gives consumers or local authorities the right of complaining to the Railway and Canal Commissioners, in addition to the existing power of applying to a Magistrate. The Act also extends the operation of the Metropolis Water Acts of 1852 and 1871, as to fittings and constant service, to the whole of the areas which the Companies are authorized to supply. The Directors do not look upon the measure as inimical to the position and interests of the Company. With reference to the Royal Commission which has been appointed to inquire into the desirability or otherwise of acquiring the undertakings of the London Water Companies, the Directors say they will give the Commission all available aid and information. The last paragraph of the report deals with the dividend. The balance applicable is £72,896; and the Directors recommend a dividend on the ordinary stock at the rate of 7½ per cent. per annum. This will absorb £64,521, and leave £8375 to be carried forward.

Historical Sketch of the Company's Progress.

Accompanying the half-yearly report is a small pamphlet, containing photographs of the Walthamstow reservoirs and of some other portions of the Company's property. They are very well executed, and, with the historical and other particulars by which they are prefaced, form an

interesting pictorial record of the Company's progress. The letterpress portion of the pamphlet is as follows:—

The East London Water-Works Company was formed in 1807, and obtained an Act of Parliament empowering them to purchase the Shadwell and the West Ham Water-Works; the former having commenced business in 1669, and the latter in 1747. In 1808, further powers were obtained; and the Old Ford pumping-station was established. In 1829, the Hackney Water-Works and Lea Bridge Mills were purchased; and an Act was obtained authorizing the removal of the intake from Old Ford to Lea Bridge. In 1853, Parliament sanctioned the construction of certain reservoirs and filter-beds, a new intake higher up the River Lea, and also the construction of an intercepting drain on the west side of the river. In 1867, two Acts of Parliament were obtained. The Thames Supply Act authorized the construction of works at Sunbury and the taking of water from the Thames; and the General Powers Act, the construction of an intake further up the River Lea, also storage reservoirs at Walthamstow, and other works. The Act of 1886 sanctioned the construction of works at Waltham Abbey and High Beech, and the diversion of the Ching Brook; and that of 1894 empowered the construction of additional storage reservoirs and other works at Walthamstow.

The pumping-stations are at Lea Bridge, Walthamstow, Chingford Mill, Waltham Abbey, Woodford, East Ham, Sunbury, and Hanworth. The high-level covered service reservoirs are at Finsbury Park, Woodford, Buckhurst Hill, and High Beech. The number of houses served is upwards of 190,000, and the population more than 1¼ millions. The population supplied by the Company, outside the County of London, is over half a million, and will, in ten years, at the present rate of increase, exceed that within the county. The daily volume of water pumped varies according to the season; but at the present time it is about 45 million gallons a day. The number of miles of water-pipes is 920, on which are attached 6400 hydrants and 7000 fire-plugs.

The area of the filter-beds, 34 in number, is 31 acres. The Walthamstow reservoirs are ten in number. Their combined water area when full is 316 acres, and their total capacity about 1200 million gallons. Two of these, recently constructed under the powers conferred by the Act of 1894, are named the Warwick reservoirs, after the Countess of Warwick, from whom the greater portion of the requisite land had been purchased. The length of "shore" line is between 12 and 13 miles. The Racecourse reservoir has been enlarged, and its capacity increased by about 200 million gallons. All the reservoirs are filled by gravitation from the River Lea at Chingford Mill. The outlet works are of masonry, and form a feature at the head of a broad open canal which conducts the water to the filter-beds at Lea Bridge. The meter-house adjoining the outlet works, contains a "Venturi" meter,* with automatic recorder. This meter will measure and record up to 60 million gallons a day. The Warwick reservoirs have been carried out by Messrs. John Aird and Sons, and the enlargement of the Racecourse reservoir by Messrs. Kirk and Randall, under the supervision of the Company's Engineer, Mr. W. B. Bryan, M.Inst.C.E.

THE OUTBREAK OF TYPHOID FEVER AT MAIDSTONE.

It is to be regretted that the hopeful tone of the concluding portion of the notice of the above calamity which appeared in the "Journal" last week has not been justified by the publication of later statistics; the number of cases of fever notified up to yesterday having reached 1300, of which about 50 have unhappily proved fatal. As the matter is now under investigation by an Inspector of the Local Government Board, it must be dealt with guardedly; but the following may, we think, be taken as fairly stating the circumstances.

The first two cases of enteric fever at Maidstone were notified on the 11th ult.; and the occurrence of four more on the following day aroused the suspicion of the Deputy Medical Officer of Health (Mr. P. Adams), who was acting in the absence of Mr. M. A. Adams, the Chief Medical Officer, on the Continent. At first the milk was suspected; and accordingly tests of it were made throughout the town. While these were going on, other cases were reported; and on the 16th ult. the number reached 27. Mr. Adams thereupon turned his attention to the water supply, and placed himself in communication with the Water Company, whose officials rendered him every assistance. The Company draw their supply from three sources—springs in the chalk at Cossington and Boarley, and others in the ragstone near West Farleigh—a hopfield locality—on the Upper Medway. The chalk water is sent for the most part into the centre and the eastern end of the town; while that from Farleigh goes to the higher portions at the western end. It was here that the fever had broken out. Having located the district attacked, the Medical Officer proceeded to inspect the Tutsham Springs at West Farleigh, with the result that the water taken fresh from this source was found to be polluted with typhoid poison. The supply from these springs was therefore at once disconnected from the mains. This was done on the 19th ult.; and it was hoped that by this action the cause of the infection had been stayed. But as the period of incubation of enteric fever extends to three weeks, it was only to be supposed that fresh cases would be notified from time to time up to that period. This has unhappily turned out to be the case.

With the view of effectually coping with the epidemic and thoroughly investigating its cause, the Urban District Council appointed a Special Sanitary Committee, and secured the services of Dr. J. W. Washbourn, Physician to the London Fever Hospital. Application was also made to the Local Government Board to send down an Inspector to conduct an inquiry. Accordingly, Dr. Theodore Thomson, one of their Medical Inspectors, went to Maidstone on Monday last week, and had an interview with the Committee on Tuesday. While expressing satisfaction with the measures which had been adopted by them for dealing with the epidemic, he said it would have been almost criminal if the Water Company had continued to supply water from the polluted springs. He shared the opinion of the Medical Officer of Health (who had been recalled from the Continent) that it would be advisable to cut off the Farleigh supply altogether; but he understood that this could not be done. Under the circumstances, therefore, the Company had adopted the right course by stopping every spring about which there was the least ground for doubt. Dr. Thomson spent several hours in examining the various sources of the Company's supply at Farleigh. In the meantime, Dr. Washbourn had been making a bacteriological examination of the water from that place; and at a meeting of the District Council on Wednesday, a joint report by him and the Medical Officer of Health was presented. It was in the following terms: "Having regard to the whole of the circumstances concerning the outbreak of typhoid fever now present in the borough of Maidstone, including the local incidence of the outbreak, the physical character of the gathering-ground of a particular section of the water supply, and certain social factors associated with the agricultural operations of hop-picking and fruit-gathering, and from carefully conducted chemical and bacteriological experiments now in progress, we have already reached conclusions of such urgent importance that we feel it incumbent upon us to communicate the same to you at the earliest possible moment, without waiting for the completion of the investigations. In due course, we shall be prepared to report in detail the facts upon which the following conclusions are based; but, from the nature of the experiments we are conducting, the full report must not be hurried. Accordingly, we beg to say we are agreed as follows: (1) From a consideration of the facts as a whole, we have no reasonable doubt but that the outbreak is due to the pollution of the Farleigh section of the Maidstone Water Company's water supply. (2) From our inspection of the physical character and conditions of the gathering-ground from which this portion of the supply is obtained, we believe that the water so derived is liable to contamination by specific typhoid polluting matter. (3) By actual observation, we obtained positive evidence of a nature that supports the belief in the possibility of such pollution. (4) By chemical and bacteriological experiments, we had obtained positive evidence that pollution by animal matter has actually taken place; and the presence of a large number of micro-organisms derived from animal alvine secretions in the water of the Tutsham field springs demonstrated that pollution of a nature calculated to produce typhoid has occurred." A long discussion followed, in the course of which the Medical Officer of Health expressed the opinion that it would be impossible to use any portion of the Farleigh water safely. It was his desire, and the strong recommendation of Dr. Washbourn, that it should be completely cut off. Alderman Ellis (the Chairman of the Water Company) stated that the report of the Company's Analyst (Dr. Gregory) showed the springs at Farleigh then in use to contain scarcely any trace of organic matter; and that if the whole of the Farleigh supply were cut off, the Company would have insufficient water to keep their mains continuously charged. Mr. Cox asked Alderman Ellis to state how often analyses had been made for the Company by Dr. Gregory. The Alderman replied that whenever a spring was to be added to the supply, the water was tested with the view of ascertaining its quality; and it was not until the Directors were assured it was good that any fresh spring was taken in. After being added, every possible care was exercised to keep the spring free from trouble. The Company did not, however, fix regular dates for analyses by Dr. Gregory. Whenever they thought it desirable to have the water examined, it was done. Mr. Cox said this was the *crux* of the whole matter. He must express his surprise that the Company had not had regular periodical examinations of their water to protect the health of the people, and in order to satisfy themselves that they were not supplying an impure and death-like liquid. There were certain springs at Farleigh which had been a source of trouble ever since the Company was started; and he thought the Directors must have known they were likely to become contaminated, being exposed to certain dangers. Mr. Cox proceeded to criticize the conduct of the Company; but Alderman Ellis objected to this. He said an inquiry was going on, and the Local Government Board Inspector would ascertain the facts of the case. He thought, therefore, that it would be in the best interests of the town that things should be left for investigation at the proper time. The Company would be happy to state the truth at the inquiry; but in the meantime he must decline to answer any more questions. They must take his word for it that the Company had, to the best of their ability, acted upon the wishes of the Medical Officer of Health, and had cut off the whole of the Farleigh water except the Ewell and Church Springs, which were certified by their own Analyst—and the fact, he thought, would not be denied by Mr. Adams—to give good water. The Mayor (Dr. Oliver) said he fully agreed with what Alderman Ellis had said. Of course, it was very natural for the public to want questions answered. But they must remember that a very grave accusation had been made against the Water Company; and it was contrary to all principles of justice that an individual should be expected to answer any question put to him under such circumstances. Therefore he hoped no other questions would be asked. The matter was, however, further discussed, and eventually a motion proposed by Mr. Cox, that the Company should be requested to suspend the entire supply from Farleigh, was carried *nem. con.* The following resolution was afterwards passed: "That the Council respectfully urge the Local Government Board to make public inquiry into the cause of the outbreak of enteric fever in Maidstone."

The source of this serious epidemic having been located, the next step will be to ascertain how far the reported cause of the pollution of the Farleigh water is correct; and how it came about that its impure condition was not detected before it was sent out for consumption. These points will, of course, be fully investigated during the inquiry. In the meantime, some light is thrown upon the latter question by the following communication sent to the papers by a local correspondent: "Now that the source of the typhoid fever scourge at present raging at Maidstone has been practically settled, much feeling has been raised against members of the old Local Board in respect to the action taken by them in regard to the analysis of the water supply; as it is now generally acknowledged that had there been a continuance of the wiser policy of fortnightly analyses, the infection would have been checked at a much earlier date, and the proportions attained would not have been nearly so serious. It is interesting in this respect to recall what happened at the Local Board meetings in regard to this matter. In 1890, at which time Mr. Adams, the Medical Officer of Health, was making a fortnightly analysis, the question of payment came forward, as he had received nothing for this duty for two years. The matter went to a Committee,

* Some particulars in regard to this meter will be found in the report of the proceedings at the annual meeting of the British Association of Water-Works Engineers (see *ante*, p. 377).

who recommended that he should be paid £81 18s. for two years' analysis of the public water. The payment of this sum was called in question; but, in answer to an objection, the Mayor stated it would not be so much in future, as the Committee had come to the conclusion not to have the water tested every fortnight. The payment was made, and the Medical Officer instructed only to make analyses of the water on the order of the Board. This, however, brought a motion from a member at a subsequent meeting that an analysis should be made every three months for the public safety. Among the grounds of objection to this motion was one that 'when analyses were made, and the water was reported to be bad, no action was taken.' It was eventually decided to have only a quarterly analysis; and this resolution has been in force since."

It is scarcely necessary to add that the greatest sympathy for the sufferers and for those who have been bereaved is felt by the Directors and shareholders of the Water Company; one of the largest of the latter going, we understand, so far as to say he would rather sacrifice his investment in the undertaking than that the patients should be losers by the outbreak. This sentiment appears to be shared by other proprietors. The Directors of the Company had a meeting on Friday to consider the request sent to them from the District Council to cut off the whole of the Farleigh supply. The Local Government Board Inspector was in attendance. After considerable deliberation, the following resolution was passed: "That the Farleigh supply of water be cut off immediately from the town. That the Town Council be requested to use other water than the Company's for flushing purposes and road watering, and be informed that it may be found necessary to limit the supply of water to less than 24 hours daily." Mr. W. J. Ware, the Company's Engineer and Manager, who has worked with most commendable zeal during a period of intense anxiety, informed the Directors that no water had been pumped from Farleigh since the previous Tuesday. The decision come to meets the wishes of the Council and gives general satisfaction; but it has been pointed out that, if a continuous supply of water from Cossington and Boarley is to be maintained, the strictest economy will have to be exercised by the consumers. Before separating, the Directors resolved to subscribe £250 towards the fund which has been opened by the Mayor for the relief of the distress arising from the epidemic. This fund, including the Company's contribution, now amounts to £700. The tradespeople of the borough have suffered considerably by the calamity which has befallen it.

OPENING OF NEW WATER-WORKS AT GODALMING.

On Wednesday, the 22nd ult., a new era in the annals of the Frith Hill, Godalming, and Farncombe Water Company was inaugurated by the formal opening of the new pumping-station recently erected in the Borough Road. It is nearly twenty years since the Company first started with works on Frith Hill. The plant then consisted of a 16-horse power steam-engine and a set of three-throw pumps, 9 inches in diameter; and the length of mains was only 8 miles. As trade increased, and the mains required to be extended, another pumping-station was found to be wanted; and this was put up and furnished with a 16-horse power gas-engine and a pair of two-throw pumps. Further additions were found to be necessary; and about two years ago Messrs. Shone and Ault were consulted on the matter. Their advice was to erect a pumping-station to supersede the two in existence, and construct a storage reservoir of brick and concrete, 80 ft. by 60 ft., and 20 feet deep, adjacent thereto. The contractors for the work were Messrs. Cooke and Co., of Battersea. The pumping plant has been manufactured by Messrs. J. Simpson and Co., Limited, of London. It consists of two triple-expansion Worthington surface condensing pumping-engines and two Lancashire boilers fitted with superheaters. Each engine has two pumps—one for lifting to a head of about 300 feet, and the other to a head of about 420 feet. The pumps delivering to a lower head are capable of forcing as much as 900,000 gallons of water per 24 hours; and the pumps of a higher head as much as 150,000 gallons in this time. The boiler pressure is 100 lbs. to the square inch; and the horse power of each engine is about 80 indicated. Each engine is arranged with two sets of cylinders side by side, and in operation the piston-rod of one set works a valve geared to the other set, and *vice versâ*; but each set controls its own cut-off. In consequence of this, before one side of the engine comes to rest, the other side begins to work; and this ensures a perfect delivery from the pumps—doing away with the necessity of any large air vessels, and obviating the risk of broken water-mains due to shocks and other violent concussions in the main which are met with in other types of pumping machinery. With one of the pumps in operation, it is possible to fill the water-tower at Frith Hill, which has a capacity of 28,000 gallons, in 20 minutes; while the filling of the Frith Hill reservoir, which takes 412,594 gallons, and the Munsted Heath reservoir, which holds 200,000 gallons, can be effected by running only seven hours a day, instead of working day and night as used to be done. Into the collecting reservoir can be pumped 17,000 gallons an hour from the various springs, 8000 gallons an hour from the bore-hole, and 5000 gallons from the old works. It is obvious that these improvements will enable a great saving to be effected in labour and expense. The total engine-house costs last year amounted to £1380; whereas for next year they are estimated at £442. The amount of water-rate collected in 1896 was £3296; the percentage of cost thereto being 41·80. For next year it is estimated at 13·42 per cent. The Company have already laid 46 miles of mains.

The Chairman of the Company (Canon Haig-Brown, LL.D.), the Vice-Chairman (Mr. J. C. Collier, J.P.), and the other Directors, with a number of shareholders, assembled in the engine-house, which had been decorated for the occasion by the Manager (Mr. J. Ede), at noon on the above-named day, when Dr. Haig-Brown started the engines, the smooth and noiseless working of which gave general satisfaction. After spending about an hour in inspecting the various portions of the machinery, the assembled company partook of luncheon. Mr. J. C. Collier, the Vice-Chairman, in proposing "Prosperity to the Frith Hill, Godalming, and Farncombe Water Company," gave some interesting figures as to the pumping. He said that, taking the records for the nine weeks of the spring and summer of last year, the greatest quantity of water pumped was 363,000 gallons per day, of which about 36,000 gallons were pumped into the Munsted Heath reservoir. The cost of raising the water in 1896 amounted to £2 4s. per day; and taking the 363,000 gallons as the average quantity lifted daily throughout the year, the cost would be more than £6 per million gallons. In dealing with this quantity, the pumps were kept going 24 hours per day. Each of the new pumps was capable of raising daily 350,000 gallons to Frith Hill, and 60,000 gallons to Munsted, or 410,000 gallons in all, working ten hours a day. The cost in full of doing this work was 12s. 4d. per day, or £1 5s. 2d. per million gallons.

Llandyfan Water Supply.—A scheme of water supply for Llandyfan is to be carried out at a cost of £2950.

Sale of Shares.—A number of £5 fully-paid shares in the Golborne Gas Company have within the past few days been sold at £8 1s. 6d. each, and similar shares, with £4 paid, have found purchasers at £8 0s. 9d. Only five years ago, these shares could be bought for £5 10s. each.

The Projected Gas-Works Extensions at Ramsgate.—Mr. W. A. Ducat, one of the Inspectors of the Local Government Board, held an inquiry at Ramsgate last Wednesday respecting the application of the Town Council to borrow £33,375, of which £20,500 will be for the extensions at the gas-works, to which reference has already been made in the "JOURNAL."

Increased Wages for Oldbury Gas Workers.—At the meeting of the Oldbury District Council last Friday, Mr. J. W. Wilson, M.P., reported that the Gas Committee had been approached by the stokers and others with a view to re-arranging Sunday labour, and for an increase of wages in certain cases. The Committee thought it best to meet the men promptly; and they had thoroughly satisfied them with what was equal to a 5 per cent. increase.

Southend Gas Company.—The Directors of this Company report that the quantity of gas sold in the half year ending June 30, as compared with the corresponding period of 1896, showed an increase of 9,256,900 cubic feet, or 39·67 per cent. The total number of consumers at Midsummer last was 2085. The accounts show that the net amount available for division is £2191, from which it has been resolved to pay dividends at the rates of 10½, 5, and 7½ per cent. per annum on the original improvement, and new ordinary shares respectively.

Unionists and the Rotherham Corporation Gas Committee.—The National Amalgamated Union of Labour, through their District Secretary, recently wrote to the Manager of the Rotherham Corporation Gas-Works to the effect that the Union men employed at the gas-works would decline, on and after Oct. 6, to work with the non-union men there unless they joined the Union. The Manager, on receipt of this threat, had an interview with the Chairman of the Gas Committee; and in pursuance of his instruction, he replied that any person employed at the gas-works was at liberty to exercise his own judgment as to whether he joined the Union or not; but that so long as he did his duty on the works, he would be found employment. The Committee will, at the meeting of the Council to-morrow, recommend that the views in this letter be confirmed and acted upon.

Cape Town Water Supply.—Reports received by the last mail show that the Cape Town Corporation have decided to proceed at once with the works for increasing the storage of water on Table Mountain. The recently completed reservoir has been named, after the Mayor (Sir John Woodhead), the Woodhead reservoir; and though it has a capacity of 225 million gallons, it is anticipated that it will not more than provide for the increasing requirements of the town in the years which must elapse before another reservoir can be constructed. With a view to an early commencement of the work, the Town Council have entered into an agreement with Mr. Thomas Stewart, M.Inst.C.E., the Engineer of the Woodhead reservoir, by which he is to design the new reservoir and superintend its construction. In addition to the plans and drawings for the contemplated works, Mr. Stewart is to prepare a map of Table Mountain above the 2000-feet contour, with a report on the question of the supply of water available therefrom. The Water Committee state that they consider this information will be of the highest value. Mr. Stewart is to receive for his services a total sum of £7770. He is also to conduct experiments and investigations, and report upon the subject of the filtration of the water, for a further fee of £50, though the Committee are of opinion that there is little need for the filtration of the water from the fine source on the mountain.

The Local Government Board and Charcoal Filter-Beds.—Within the boundaries of the shire of Bedlington, some 22,000 people are supplied with water for domestic consumption by means of a system attached to which are filter-beds of animal charcoal. It was only a few years ago that, owing to some alleged defects in the then existing sand and gravel filter-beds, the Surveyor to the District Council (Mr. C. C. Cooper) recommended the introduction of charcoal for filtering purposes; and the Local Government Board gave their consent to the borrowing of £2500 to carry out the work. All the water used for domestic purposes throughout Bedlingtonshire is pumped from the River Blyth by an engine of 50-horse power. Before it enters the reservoir the water is passed through four pairs of high-pressure steel cylinder filters, each 4 feet in diameter, and 4 feet high. Each filter contains 3ft. 2in. of animal charcoal, or about 15 cwt. in each cylinder. The charcoal is placed in layers, from coarse at the bottom to fine in the centre, and then to coarse again at the top. The water goes into the cylinders at the bottom, and passes out at the top either into the mains or storage reservoir. The filtering capacity of the filters equals 40,000 gallons per hour. There is a cleansing process every day, by reversing the flow; and the charcoal is renewed once every twelve months, at a cost of about £100. The District Council having applied for permission to borrow £2000 for conveying a more adequate supply to North Blyth, an inquiry was held a short time since by an Inspector of the Local Government Board (Mr. Mead-King); and, on his report, the Board decided that they could not sanction a further loan until the Council gave some tangible evidence of doing away with the charcoal filter-beds which "were merely interceptors of dirt, and did not purify or oxidize the water"—the substitution of sand and gravel filter-beds being recommended. The Local Government Board having given their approval to the system of charcoal filtration, so recently as 1894, their decision has caused some surprise in the locality.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners on Monday last held their first meeting since July 26; the holidays having intervened. They had consequently somewhat more than the usual amount of business to transact. The report of Mr. Herring, the Engineer, showed an increased output of gas during July of 3,666,000 cubic feet, and during August of 4,359,000 cubic feet; the total increase for the two months having been 8,025,000 cubic feet. A report by the Treasurer (Mr. J. A. Gibb) was also submitted, in which he stated that he had calculated the probable net cost of the production of gas during the coming year; and having had the benefit of statements by the Chief Engineer, as to the probable cost of production at the various manufacturing stations, and assuming the amount and quality of gas to be the same as last year, and that the gas was made from coal alone as before, he estimated that the net cost per 1000 cubic feet of gas accounted for would be 35·97d. Following upon this report, the Finance Committee recommended the Commissioners to continue to supply gas of 24 to 26 candle power, and to charge therefor to the ordinary consumers at the rate of 3s. per 1000 cubic feet, subject to the present rates of discount; the above charge to take effect on all accounts issued subsequent to those usually rendered in October-November, and to continue in force for a year thereafter. The price for public lighting of the burghs of Edinburgh and Leith to be 2s. 6d. per 1000 feet net; being 1d. per 1000 feet less than the estimated cost, even after debiting only 5·85d. for capital and other charges, in place of the 10·85d. mentioned in the Treasurer's report. This price to take effect in Edinburgh during the year from and after Nov. 16 next, and in Leith during the year from and after Dec. 1 next. In dealing with these reports, Bailie Kinloch Anderson said that the Works Committee approved of the Engineer's report, which was satisfactory in every respect. There was an increase of something like 4½ million cubic feet of gas for August. The matter of greatest importance was the fixing of the price of gas to be charged to ordinary consumers for the next twelve months, and also for the public supply. The report recommended that 3s. per 1000 cubic feet be the price to ordinary consumers; the charge to take effect on all accounts issued subsequently to those rendered in October and November. The estimate for the year showed that they were very safe in doing this. It showed that the cost, including all charges, was more than a farthing under the 3s.; and they had estimated that, even with the low prices recently received for residuals, which they hoped would improve, they should work out successfully to the end. As to the public supply, the Committee recommended that it be at the rate of 2s. 6d. per 1000 feet net. The rate last year, when the ordinary price was 3s., was 2s. 1½d.; and the increase in price was therefore 4½d. per 1000 cubic feet. The charge of 2s. 6d. was the cost price, including interest on the capital, but excluding contributions to the sinking fund and the cost of collecting and surveying. They thought, as a Sub-Committee, and the Works Committee approved, that they should not charge the public authorities with contributions to the sinking fund. In respect to the increase, there had been a very large deduction made in the charge for the public supply since 1888. When the first account was sent in after the Commission was formed, there was some amount of grumbling by the Edinburgh Corporation; and it was ultimately agreed that, from Nov. 16, 1888, till May, 1890, the public lamps should be charged at 2s. 6d. per 1000 cubic feet, or 1s. under the usual rate This was continued till November, 1894. For the two succeeding years the rate charge was 11d. and 10½d. less than the price to ordinary consumers. If there then was any loss at all from supplying the public, it was borne equally by the ratepayers, who were gas consumers. Circumstances, however, had changed; and all the ratepayers were not now gas consumers. Some of the more wealthy, and the Corporation, had gone over to the electric light; and so the section of gas consumers, who were perhaps least able to bear it, would have the burden to bear from any deficit caused by supplying the public authorities at the former discount. The Sub-Committee therefore thought they were dealing very equitably when they only charged interest on the capital. Mr. John Jamieson, who is the gentleman responsible for the charge for the gas supplied for the lighting of common-stairs having been thrown on the rates, moved that before they fixed the price of gas for public lighting they should have a conference with the Corporations of Edinburgh and Leith. If they maintained the price at the present figure of 2s. 1½d. per 1000 cubic feet, the loss to the Commissioners would only be about £3000; and this was nothing upon a revenue of nearly a quarter of a million. If there had been any necessity for increasing the price, he would not have opposed the proposal. They had a report by Mr. Herring which told them that there had been a yearly increase in the output of gas of 5 or 6 per cent. If they had a 5 per cent. increase this year, their revenue would be £11,500 more. Lord Provost M'Donald thought the Works Committee should endeavour to work on friendly lines with the Corporations, and they should agree to the proposal for a conference. Bailie Kinloch Anderson, with his usual good sense, accepted the suggestion as to holding a conference, provided that the price of gas for private lighting was then fixed at 3s. per 1000 cubic feet. This was accordingly done.

The Commissioners then proceeded to what appears to be a surrender to the labour members. These gentlemen obtained a remit to consider as to the raising of the wages of all the labourers in the service of the Commissioners from 21s. 3d. to 22s. per week. There had been no complaint on the part of the men as to insufficient pay; and the action of the proposers of the motion was taken more as a protest against the raising of the salaries of some of the higher officials. The movement succeeded better, probably, than was expected; for the Works Committee recommended that the wages of all able-bodied labourers should be raised to 22s. per week. The Commissioners agreed. It will be observed that the increase is restricted to "able-bodied" men. The expression may mean something; and if so, the determination of who are and who are not able-bodied men will be the duty of the Station Managers, for which they will deserve commiseration.

It was reported that the Assessors had valued the Commissioners' undertaking for the current year as follows—viz.: Burgh of Edinburgh, £32,878, as against £30,895 last year; Burgh of Leith, £7775, as

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 728.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 9	10½	Alliance & Dublin 10 p. c.	24½–25½	..	4 2 4
100,000	10	„	7½	Do. 7 p. c.	17–18	..	4 3 4
300,000	100	July 1	5	Australian 5 p. c. Db.	106–108	..	4 12 8
200,000	10	May 27	7	Belgrano (B. Ayres), Ltd	10–10½	+½	6 13 4
100,000	Stk.	June 29	5	do. 5 p. c. Db. Stk.	103–106	..	4 14 4
200,000	5	May 27	6½	Bombay, Ltd.	6⅞–7¼	..	4 9 7
40,000	5	„	6½	Do. New, £4 paid	5⅛–5⅜	..	4 10 7
380,000	Stk.	Aug. 27	12	Brentford Consolidated	29/–302	..	3 19 5
240,000	„	„	9	Do. New	222–227	+2	3 19 3
50,000	„	„	5	Do. 5 p. c. Prf.	145–150	..	3 6 8
159,375	„	June 11	4	Do. 4 p. c. Db. Stk.	135–139	..	2 17 6
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	270–275	..	4 3 7
208,820	„	„	8½	Do. A. Ord. Stk.	201–205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130–135	..	3 14 1
420,000	20	Sep. 30	11½	British	55½–56½*	..	3 19 7
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	23–25	..	4 12 0
71,000	10	„	8½	Do. 7 p. c.	18–20	..	4 5 0
500,000	10	Apl. 28	6	Buenos Ayres (New) Ltd	10¾–11¼	..	5 4 4
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98–100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30–32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16–17*	..	4 14 1
50,000	50	May 3	6	Do. 6 p. c. 1st Mort.	59½–60½	+½	4 19 2
550,000	Stk.	Apl. 9	13½	Commercial Old Stock	345–350	+2	3 17 1
165,000	„	„	10½	Do. New do.	258–263	+1	3 19 10
165,000	„	June 11	4½	Do. 4½ p. c. Db. do.	155–158	..	2 16 11
800,000	Stk.	June 11	13	Continental Union, Ltd.	257–262	+2	4 19 3
200,000	„	„	10	Do. 7 p. c. Prf.	217–222	+2	4 10 2
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315–320	..	4 7 6
163,400	„	„	11	Do. B 7 p. c.	252–257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	137–140	..	3 15 0
60,000	„	„	5	Do. 5 p. c. Prf.	140–143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	25½–26½	..	4 3 0
354,060	10	„	11	Do. £7 10s. paid	18–19	..	4 6 11
5,896,590	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord.	316–319	..	3 19 11
100,000	„	„	4	Do. B, 4 p. c. max.	113–118	..	3 7 10
665,000	„	„	10	Do. C, D, E, 10 p. c. Prf.	317–322	..	3 2 2
30,000	„	„	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	„	„	7½	Do. G, 7½ p. c. do.	220–225	..	3 6 8
1,300,000	„	„	7	Do. H, 7 p. c. max.	203–206	..	3 7 4
463,000	„	„	10	Do. J, 10 p. c. Prf.	315–320	..	3 2 6
476,000	„	„	6	Do. K, 6 p. c. Prf.	180–185	..	3 4 10
1,061,150	„	June 11	4	Do. 4 p. c. Db. Stk.	138–141	..	2 16 9
294,850	„	„	4½	Do. 4½ p. c. do.	156–159	..	2 16 7
908,000	„	„	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	May 13	8	Hongkong & China, Ltd.	14–15	..	5 6 8

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stk.	May 13	10	Imperial Continental	217–222	..	4 10 2
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99–102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104–107	..	3 5 5
75,000	5	June 29	6	Malta & Medn., Ltd.	5½–6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne, 5 p. c. Db.	110–112†	+½	4 9 3
250,000	100	„	4½	Do. 4½ p. c. Db.	106–108†	+½	4 3 4
541,920	20	June 11	5	Monte Video, Ltd.	15–16	..	6 5 0
150,000	5	May 27	8	Oriental, Ltd.	8⅛–8¾	+¼	4 11 5
135,000	5	„	8	Do. New, £4 10s. pd.	7½–7¾	..	4 12 10
15,000	5	„	8	Do. do. 1879, £1 pd.	1⅝–2	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4½–5*	..	7 0 0
420,000	100	May 3	6	People's Gas of Chicago, 1st M. Bd	104–109	..	5 10 1
500,000	100	June 1	6	Do. do. 2nd do.	105–110	..	5 9 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	14–15*	..	6 13 4
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p. c. Ord	145–148	..	3 10 11
1,416,667	„	July 15	3	Do. 3 p. c. Db. Stk.	106–109	..	2 15 0
60,000	Stk.	Sep. 15	12	Tottenham and Edmonton, A.	280–290	+5	4 2 9
60,000	„	„	9	Do. B.	205–215	+15	4 3 9
182,380	10	May 27	10	Tuscan, Ltd.	13¾–14½	..	6 18 0
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	100–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stk.	June 29	10½	Chelsea, Ord.	337–342	..	3 1 5
150,000	„	„	5	Do. 5 p. c. Prf.	177–180	..	2 15 6
160,000	„	„	4½	Do. 4½ p. c. 1 f. Stk., 1875	157–160	..	2 16 3
175,785	„	Sep. 30	4½	Do. 4½ p. c. Db. Stk.	160–165	+2¼	2 14 6
1,720,560	Stk.	Apl. 9	7½†	East London, Ord.	230–235	+3	3 3 10
654,740	„	June 29	4½	Do. 4½ p. c. Db. Stk.	163–166	..	2 14 3
390,000	„	„	3	Do. 3 p. c. Db. Stk.	106⅛–107½	..	2 15 10
700,000	50	June 11	7½	Grand Junction, 10 p. c.	120–125	..	3 0 0
295,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147–152*	+1	2 12 8
708,000	Stk.	Aug. 12	13	Kent	352–357	+1	3 12 10
160,000	„	„	7	Do. New, 7 p. c. max.	215–220	..	3 3 7
1,043,800	100	June 29	9½	Lambeth, 10 p. c. max.	290–295	+2	3 6 1
406,200	100	„	7½	Do. 7½ p. c. max.	223–228	..	3 5 9
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147–150*	+2	2 13 4
500,000	100	Aug. 12	13	New River, New Shares	448–453	+1	2 17 4
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	151–154	..	2 11 11
902,300	Stk.	June 29	5	Southw'k & V'xhall, Ord.	161–164	+1	3 0 11
126,500	100	„	5	Do. do. 7½ p. c. max.	151–154	..	3 4 11
489,200	Stk.	„	5	Do. do. 5 p. c. Prf.	173–178	..	2 16 2
1,019,585	„	Apl. 9	4	Do. 4 p. c. A Db. Stk.	145–148	..	2 14 2
1,155,066	Stk.	June 11	10	West Middlesex	315–320	..	3 2 6
200,000	„	„	4½	Do. 4½ p. c. Db. Stk.	163–166	..	2 14 3

*Ex div.

† Next dividend will be at this rate.

against £7900 last year; County of Edinburgh, £1120, as against £1195 last year; and the County of Haddington, £69, as against £70 last year. This is a net increase of £1782.

The beautiful after-luncheon homily by Sir William Arrol, M.P., on the removal of the Edinburgh Gas-Works from the present site, has given rise to quite a little torrent of opposition to their continuance where they are. The most doughty champion of the party who desire removal—after, of course, Sir William Arrol—is Dr. Taylor, a medical gentleman resident in the city, who on Tuesday of this week published a letter in the "Scotsman" on the subject. Dr. Taylor's voice has been heard before protesting against the gas-works being kept as a blot upon the face of the city; and I do not know that I would concern myself about his writings now, except that he gives an account of proceedings which he actually took two years ago with a view to influencing the Authorities to take steps for the removal of the works. His letter is so voluminous that I cannot incorporate it in my "Notes." Dr. Taylor seems to look upon the Gas Commissioners as a body whose sole aim and object it is to make and sell gas. That is not so, as he would know if he were, say, invited to any of the annual dinners of the Commissioners, or were in some other way to have his mind's eye opened as to the difficulties of the Gas Commissioners on this and other subjects. He forgets that the Commissioners work under an Act of Parliament, which very strictly defines their duties, and does not give much latitude to them in matters of policy. With much that he writes, it is possible to agree; but it is new to me to learn that the fumes from a gas-works are unhealthy to the extent he makes out. That they are disagreeable, everyone knows; but that is a different matter from being unhealthy. Dr. Taylor's letter is, however, a model of common sense when compared with that of Mr. J. Bruce, an eminent lawyer, and member of the School Board, which appeared in the same newspaper two days later. Mr. Bruce allows his reasoning powers to be run away with altogether. He says: "To me it seems a question whether the Commissioners are not daily and hourly contravening the police law of the city, by which it is an offence to allow smoke to issue from any building except at its top. Let any of your readers look down from the Regent Road, in front of the High School, and he will see what I mean. Looking into the black abyss of the gas-works, he will see rows of long low buildings, with long openings in their roofs, and apparently long openings in their sides; and from these openings, continuous smoke and fumes issuing. Were the smoke and fumes all discharged from the old chimney or the new, they would at once enter the upper air, and perhaps do no great harm. But as it is, the larger part of the smoke and fumes of an enormous manufacture enters the air at so low a level that it pollutes the air our people breathe, begrimes the dwellings they inhabit, and casts a veil of sadness over the residence of our old Scottish kings and the whole valley of the Calton." To all of which I would say that men of so pronouncedly one idea as Mr. Bruce reveals himself to be, usually help to defeat the purposes they have in view. The removal of this particular gas-works is a very desirable thing; but if it is to be accomplished, it must be done by more convincing argument than has yet been put forward. After all, why not wait till it be seen what action is taken upon Mr. Herring's report, which, by the way, Dr. Taylor seems to think followed the remarks of Sir William Arrol, instead of preceding them?

The Gas Committee of the Glasgow Corporation on Thursday opened and fixed tenders for about 50,000 tons of coal, for delivery during the next six months. This quantity is only half what was recently advertised for. The prices which have been accepted are: Splint, 7s. 3d. to 7s. 5d. per ton; first-class cannel, from 1s. to 1s. 6d. higher than June rates (but the June rates were the lowest recorded for ten years); and whole seam, 6d. advance upon the June rates. The whole-seam purchases are in lots of 10,000 tons and under; and the cannel, in lots of 5000 tons and under. No third-class cannels were bought. It is expected that the balance of the coal which is required—about 100,000 tons—will be negotiated for privately. The fixing of the Glasgow Corporation gas coal contract is always important, as it furnishes a good indication as to the course of the coal market for the succeeding months. The significance on this occasion is that the Committee have been unable to get coal so cheaply as before, or at rates which were satisfactory to them. This points to the expectation of coal masters that the eight-hours hydra will be scotched, if not kil'ed, at an early date, and that then trade generally will be better than it has been. Prices for coal are likely to rise; and those who have not secured their requirements for the year, had probably better see to their contracts without delay, or they may fare worse.

Mr. D. Easson, who has been appointed Manager to the Maybole Gas Company, has received a copy of a resolution adopted by the Perth Gas Commissioners, at a special meeting which the Commissioners held last week, at which his resignation of the post of Assistant Gas Manager was accepted. Bailie Wright, the Convener of the Works Committee, said they accepted Mr. Easson's resignation with extreme regret, because they were losing the services of a faithful servant. Mr. Easson had been in the employ of the Commission for a good many years; and he knew that every Convener who had been at the gas-works had had the highest praise for the services he had rendered to the community of Perth.

I have before commented upon what I regard as the folly of the Arbroath Town Council in seeking to extend their present underground water supply to the town, instead of adopting a gravitation scheme, as to the necessity for which they have a report by an eminent water engineer. The present supply, which is wholly pumped, is only about 14 gallons per head per day of the population; and the Council's system of extending adits to the wells, is merely a tinkering with the subject. The opinion is not mine, nor is it that of the engineer to whom I have referred, though it coincides with his. It is—and here I tread on treacherous ground, because I got the opinion privately—the view of one who has certain duties to perform in connection with the tinkering scheme, but whose opinion has not been asked, and who is simply carrying out orders he has received. It is amazing to me that the Commissioners have not discovered that they are on the wrong track; but they are probably suffering from local blindness. Their attention is more directed to controlling the operations of the Contractor who is making the adits, than to the general question of water supply. The construction of these adits is proving a troublesome work; and the Water Committee

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have this week resolved to proceed to arbitration on the question of whether the contract is being carried out according to the agreement. This step is being taken with a view to avoid litigation; but I am doubtful whether it will have this effect. The consequence will be that both time and money will be expended upon a minor point, which could be applied with greater advantage to the promotion of a scheme which would place the water supply of the town upon a permanent and satisfactory basis—a work which, it is almost safe to prophesy, will have to be undertaken at a very early date.

The Edinburgh and District Water Trust have lately fixed their rates for the current year. The estimate of the Treasurer (Mr. W. Anderson) was that the revenue from all sources except the domestic and public water-rates would amount to £49,165, or, deducting unrecoverable arrears, to £48,850; and as the estimated expenditure would be £101,241, a sum of £52,661 would have to be raised by rates. The rental of the district is £2,652,369; and he proposed a domestic rate of 5d., a shop rate of 2d., and a public rate of 1d. in the pound—all being the same as last year. The total sum thus raised would amount to £50,551. In submitting these estimates, ex-Provost Wood said that most of the increase in the expenditure was due to alterations in piping, owing to the operations of cabling the streets for the tramways, interest on money borrowed for new works, law expenses incurred in connection with the Clippens cases, and for agents' commission on loans on mortgage—a large number of which mature during the year—and also for new loans. Looking at the estimated receipts for the year, by maintaining the same water-rates as last year, and adding a normal increase, and also allowing for additional receipts from distribution renewals and rents, there was an increase over the actual receipts of 1896-97 of £2049. The estimate showed an excess of expenditure over income of £2110, which would be met by the surplus which had accumulated from year to year. It was matter for congratulation that, even with the increased expenditure in connection with their present works, and the payment of interest on money required for the Talla works—now well in hand—by drawing on the surplus to a small amount, they were able to maintain the domestic rate at the reasonable sum of 5d. in the pound. They had a revenue fund laid aside of about £27,000, which had been saved during the past few years, and which could be drawn upon during the next five or six years, and which, he hoped, would carry them through without having to increase the rates.

Judgment has been given by Lord Pearson, in the Court of Session, in the action, I have previously mentioned in these "Notes," in which the Edinburgh and District Water Trust seek to interdict the Clippens Oil Company from working out shale and limestone from below their pipe-tracks in the estates of Straiton and Pentland, or within 40 yards of the track. Lord Pearson has interdicted the working out of the limestone; but has allowed the working of the shale to continue. The decision, like so many others, is disappointing, because it was expected to go some length in the laying down of a general rule for the preservation of pipe-tracks from underground workings; but Lord Pearson, with the usual timidity of the judicial mind, has confined himself to an interpretation of the documents conveying the rights which they possess in the lands to the Water Trustees. This means that Lord Pearson declines to enact a law on a subject upon which no law has, as yet, been laid down. I am not an admirer of judge-made law; but, in a case like this, law is not a matter of formal enactment—it is established by usage and custom. Lord Pearson, it is true, made inquiry into what was the custom; but he made the inquiry subservient to the words in the Trustees' title, which reserves to the owners of the minerals to conduct all "usual operations." Lord Pearson did not imply the words "in such cases," but held a general inquiry into what was the usual practice. He concludes, upon sworn testimony as to practice, that it is the custom to work out shale, but not limestone; and he decides accordingly. Had the parties known that his Lordship was to go no further than this, they could have discovered the facts for themselves at the cost of a few postage stamps; but, as it is, they have expended probably £2000, and have obtained little or no enlightenment. If the judgment is to stand, it means that the Oil Company cannot take out the limestone from below the pipe-track, but that they can take the shale, and that, therefore, the Water Trustees must, if they wish to protect their mains from subsidence, acquire the shale. I confess I see nothing wrong in this, unless the Trustees should be apprehensive that it would form a precedent for their acquiring minerals everywhere, which would be a heavy obligation. They will, however, be guided by Counsel, who, as usual, will not care to give a decision on the matter; and so the question raised will possibly have to be decided by the House of Lords, somewhere about a year hence. Meanwhile about 300 workpeople in the employ of the Oil Company have been thrown out of work.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 2.

Sulphate of Ammonia.—The closing days of the month of September saw very keen competition for ready parcels; extreme prices being paid to fill urgent orders. October has, however, opened with a quieter market, and less doing; available supplies having been removed on the one hand, while, on the other, buyers are under no immediate necessity to fill the month's requirements. It will be found, too, that a considerable portion of October production has been sold; so that makers will probably be disposed to look on with complacency in the meantime. The closing quotations are £8 2s. 6d. per ton f.o.b. Hull and Leith, and £8 5s. per ton f.o b. Liverpool. Less attention has been paid to the forward position; buyers not seeing their way to paying the prices asked by makers. But it is reported that £8 7s. 6d. per ton has been paid for December-March delivery, f.o.b. Leith.

Nitrate of Soda is quiet at 7s. 4½d. per cwt. for good up to 7s. 6d. per cwt. for fine quality, on spot.

LONDON, *Oct.* 2.

Tar Products.—There is no new feature in this market. Benzols continue firm and carbolic acid is in better request. Pitch is slightly better; but there is no improvement in value. There is a good demand for common oils, as well as for solvent and ordinary naphthas. Naphtha-

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lene is also looking up; but, at the present price of oils, it scarcely pays for extraction. Important tar contracts have been let at the prices mentioned below. The difference in value is represented by the mode in which the tar is produced, and the position of delivery.

To-day's values are: Tar, 17s. to 21s. Pitch, west coast, 16s. 6d.; east coast, 19s. 6d. to 20s. 6d., according to port. Benzol, 90's, 1s. 11d.; 50's, 2s. Toluol, 2s. 2½d. Solvent naphtha, 1s. 7d. Crude, 30 per cent., naphtha, 11d. Creosote, 1¾d.; liquid, 2¼d. Heavy oils, 32s. 6d. Carbolic acid, 60's, 1s. 10d. Naphthalene, pressed, 55s.; salts, 25s. Anthracene, "A," 5d. to 6d.; "B," 4d. to 5d.

Sulphate of Ammonia is scarce and difficult to buy for prompt shipment. Makers are fully sold; stocks in the country are remarkably low; and the prospect for futures is encouraging. Business has been done at Beckton, £7 17s. 6d.; London, £8 2s. 6d.; Liverpool, £8 5s.; Hull, £8 2s. 6d.; Leith, £8 5s.—all less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The upward move in prices, to which reference was made last week, has been generally well maintained, and has extended to slight advances upon some special qualities of coal. For house-fire purposes there is a fairly good demand, and pits are practically on full time, with most of the output now going away; and prices may be said not only to have stiffened up all through to full list rates, but in some cases to have been advanced slightly upon the prices ruling at this time last year. At the pit mouth, 10s. 6d. to 11s. per ton is now quoted for best Wigan Arley; 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley; and 7s. to 7s. 6d., for common house coal. Other descriptions of fuel, however, have not participated in any appreciable improvement. Common round coals for steam and forge purposes continue plentiful, and move off but indifferently. It is exceptional where more than about 6s. per ton at the pit is being got for ordinary steam coal. Engine classes of fuel are also coming upon the market in excess of requirements; and not only is the output of slack increased by the extra activity in house coals, but there is a lessened demand for mill purposes. Prices are weak, though quotations remain generally at 3s. to 3s. 6d. per ton at the pit for common slack, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 4s. 9d. for best qualities. For shipment, a fair amount of business is still reported, with ordinary steam coal fetching 7s. 6d. to 8s. per ton delivered at Mersey ports or on the Manchester Ship Canal.

Northern Coal Trade.—There is a continued good demand for steam coals, before the close of the shipments to some of the best of the northern ports that are the chief customers for this class of fuel; and this will probably continue for a few weeks to come. Best Northumberland steam coals are 8s. 6d. per ton f.o.b.; and second-class steam coals, 8s.; and steam smalls, 3s. 6d. In the Durham coal trade, there is an increasing demand, as usual at this season. The gas coal trade is firm; and the price is from 7s. 9d. to 8s. per ton for odd cargoes, though much of the output is on contracts that are at lower rates. For such as are now in the market, the quotation is nearer to that just given; and one coal-owner asks 8s. 3d. per ton f.o.b. There is only a moderate demand for manufacturing coal, owing to the continuation of the strike. Gas coke is unaltered this week.

Scotch Coal Trade—Trade is active in all its branches. The miners have given up the idea of working four days per week, and are now working five, and in some cases six, days. There is a good demand generally; splint being in least request. Steam coal is being particularly looked after. The prices quoted are: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 6d. to 7s. 9d.; and splint, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 150,014 tons—a decrease of 21,336 tons on the preceding week, and of 2400 tons on the corresponding week of last year. For the year to date, the total shipments amounted to 5,983,127 tons—an increase upon the same period of last year of 217,810 tons.

A Proposed New Reservoir for Ipswich.—In view of the fact that the capacity of the present reservoirs are only sufficient to meet about 1½ days' requirements, the Water Committee of the Ipswich Corporation are of opinion that steps should be taken to provide additional storage accommodation at an early date. The Council have endorsed this view, and have sanctioned an arrangement to acquire the necessary land.

Completion of the Purchase of the Ashford Gas-Works.—Last Wednesday, a cheque was drawn on the London and County Bank by the Ashford Urban District Council for the sum of £37,642 9s. 4d. for the completion of the purchase of the undertaking of the Ashford Gas Company. The Council have arranged with the London and County Banking Company for the borrowing of £40,000 at the rate of 2 per cent. per annum, repayable on the 1st of June next. The amount was made up of £34,080 for purchase, £2398 13s. 10d. for stock, £363 15s. 6d. for interest, £300 for working expenses, and £500 to be paid to the Company, under the Act, towards their costs.

New Water Reservoir for Cardiff.—With appropriate ceremony, the new reservoir which the Cardiff Corporation have constructed at the foot of the Brecon Beacons was formally opened last Thursday by Alderman David Jones, J.P., the Chairman of the Water Committee, in the presence of the members and officials of the Council and several guests. The reservoir is situated a distance of 34 miles from Cardiff, and is the northernmost of the chain of three large storage reservoirs, the powers to construct which were obtained by the Corporation in 1884. It has been built to contain 335 million gallons of water. Its estimated cost, including conduit No. 1, railway plant, huts, &c., was £198,700; and up to the present time £189,500 has been spent. The whole of the work has been carried out by workmen in the direct employ of the Corporation, under the supervision of the Engineer-in-Chief, Mr. J. A. B. Williams. In the course of the proceedings on Thursday, Alderman Jones was presented, on behalf of Mr. Williams, with a silver gilt key; and the function concluded with a luncheon provided by the Mayor (Alderman Beavan) and Alderman Jones.

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Boston (U.S.A.) Water Supply.—According to a recent report, very satisfactory results were obtained by the Boston Water Department in the last financial year; for though great waste of water employed for domestic purposes was shown by the Deacon meters, and many large extra expenses were incurred, the income increased, and the indebtedness was reduced in a marked degree. The net receipts for the year were $2,496,636; and the total expenses, $2,081,007. The cost of the entire plant up to Feb. 1, 1897, was $27,533,793. There were 36 miles of mains laid. The works supply 598,957 people. During the year, 5,182,810,750 gallons of water were pumped in the Cochituate, and 4,374,112,900 gallons in the Mystic system. At Cochituate it costs $5 74 to pump a million gallons, and 88c. at Mystic.

The Proposed New Water Schemes for Carlisle.—In the "JOURNAL" for August 17, we gave a full abstract of the report submitted to the Gas and Water Committee of the Carlisle Corporation by their Engineer (Mr. C. B. Newton, Assoc.M.Inst.C.E., F.C.S.) on three proposed schemes for improving the water supply of the city. The first provided for obtaining 2½ million gallons of water daily by gravitation from the River Gelt; the second was for furnishing the city with a supply drawn from the River Eden, about ten miles above the present intake; and the third was for extending and improving the existing works so as to yield a daily supply of 1,650,000 gallons. The cost of the three schemes was estimated at £129,320, £90,577 (or £65,989 with certain modifications), and £38,679. It was decided to obtain the advice of Mr. E. M. Eaton, Assoc.M.Inst.C.E., on the matter; and his report was issued last Tuesday. He condemns the existing works as being "altogether behind the requirements of the present day, and utterly unworthy of a town of the importance of Carlisle." He then goes fully into the merits of the schemes, and "on the ground of economy, purity of supply, and simplicity of working arrangements," he unhesitatingly recommends the adoption of the first—the Gelt scheme—which he thinks could be carried out for £120,000.

New Joint Stock Companies.—The Burnden Tar Company (Bolton), Limited, has been formed with a capital of £10,000, in £10 shares, to carry on the general business of chemical manufacturers. The Incandescent Fire-Mantel and Stove Company, Limited, has been registered with a capital of £75,000, in £1 shares, to adopt an agreement made between the Incandescent Fire-Mantel and Stove Company, Limited, and H. E. Baker, the Liquidator thereof, and the new Company, and to carry on the business. The Thornton-Scarth Automatic Lighting Syndicate, Limited, with a capital of £20,000, in £1 shares, has been formed to acquire certain patents rights not specified.

Bolton and the Control of its Watersheds.—The Water Committee of the Bolton Corporation are pursuing a policy which is being watched with great interest locally, and by other Municipalities. Their watersheds lie on the wide stretch of hills which surround the town; and the Corporation are purchasing the farm lands which chiefly constitute the gathering grounds, in order that they may exercise full control, and prevent the supply from being contaminated in any way. They have already acquired several estates; and the farms and premises are let by the Water Department upon conditions which secure an absolute immunity from pollution of the sources of supply. In 1894 the Local Government Board granted an Order empowering the Corporation to borrow £100,000 for water-works purposes; £65,536 being for the purchase of lands. Arrangements having been completed for the purchase of three other estates on the Entwistle watershed, Mr. Herbert H. Law, on behalf of the Local Government Board, held an inquiry last Tuesday into an application to borrow £14,400 for the purpose and new mains. It was explained that on this gathering-ground the department already own and control 1437 acres, and that an offer had been made for another estate. It was further stated that the average consumption of water was equal to 5¼ million gallons per day, that the population supplied numbers 260,000, that the water is of good quality, most of it filtered, and that the pressure is superior to that of Manchester.

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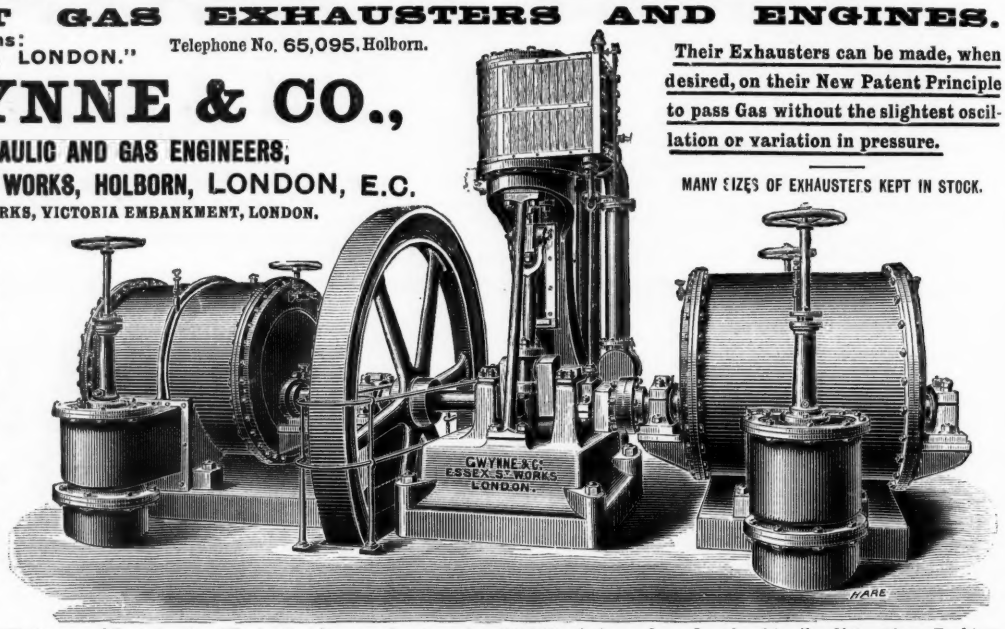

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CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.
WANTED, a Works Manager. Salary £200 per annum, with Residence, Fuel, and Light.
Candidates must be thoroughly conversant with the details of a Gas-Works, and have a practical knowledge of the construction and working of them.
Applications, stating Age, Qualifications, and previous Experience, to be addressed to the undersigned not later than the 13th inst.
No personal application to be made.
E. J. HOLWELL,
Secretary.
Snake's Lane, Woodford,
Essex, October, 1897.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

PURIFIERS FOR SALE.
EIGHT or Four C. & W. Walker's Puri- fiers, 12 feet square by 4 feet deep, with Six 12-inch Bye-Pass Four-Way Valves and Connections, complete, with fixed Hydraulic Lifting Gear.
For further Particulars, apply to H. WILKINSON, Secretary and General Manager, Gas Company, HARROGATE.

SPECIAL Bargains—6000 Cubic Feet per hour EXHAUSTER, £27; and STATION METER, £35. 20-inch GOVERNOR, £65. SCRUBBERS 5 ft. by 15 ft., £24; 5 ft. by 30 ft., £48. Four PURIFIERS and CENTRE-VALVE, complete, £75. GASHOLDERS, 50 ft. by 18 ft. and 44 ft. by 14 ft.
Address No. 2919, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PATENT FOR SALE.
THE Inventor of a Retort-Lid Fasten- ing, which is well spoken of, and has met with a considerable measure of success, is anxious to dispose of his PATENT RIGHTS to a Firm of Manufacturers, or other Capitalists, for a Sum down or by Instalments, as may be agreed.
Full Particulars will be sent on application, by letter, to No. 2927, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, or NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

HYDRATED OXIDE OF IRON.
PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.
DON'T forget to Order your 1898 Cycle from the MELROSE CYCLE COMPANY, COVENTRY.

FOR SALE—350 Tons of 24-inch Cast- Iron SOCKET PIPES. TENDERS are invited for purchasing the above surplus Stock.
All Particulars will be given on application to the Secretary, J. L. WILKINSON, Water Company's Offices, PORTSMOUTH.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Directors of the Budleigh Salterton Gas Company, Limited, are desirous of receiving TENDERS for a GASHOLDER, 50 ft. by 16 ft., and a STEEL TANK for the same.
Plans, Specifications, and Conditions may be obtained of the undersigned, to whom sealed Tenders must be sent on or before Tuesday, the 19th of October, 1897; but the Directors do not bind themselves to accept the lowest or any tender.
W. A. PADFIELD.
Gas Offices, Exeter.

COMMERCIAL GAS COMPANY.
THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works for the Twelve Months ending Sept. 30, 1898.
The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:
At the Stepney Works, on the Regent's Canal—
2000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
2000 chaldrons (of 48 bushels) of Rough Pan Breeze.
At the Wapping Works, on the River Thames—
2000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
2000 chaldrons (of 48 bushels) of Rough Pan Breeze.
At the Poplar Works, in Bow Creek (free waterway)—
4000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
4000 chaldrons (of 48 bushels) of Rough Pan Breeze.
The tenders may be for the whole or for one or more Works separately.
The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.
The form of agreement to be signed can be seen at the Company's Offices.
Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 7th of October prox.
The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.
Commercial Gas-Works, Stepney, E.,
Sept. 24, 1897.

BATTERSEA POLYTECHNIC, London, S.W.
DAY COURSES IN APPLIED CHEMISTRY FOR TECHNICAL STUDENTS.
Head of Chemical Department—W. A. BONE, D.Sc., Ph.D.
Special Day Courses of Instruction in EXPERIMENTAL CHEMISTRY as applied to GAS MANUFACTURE will be given during the ensuing Session, commencing Oct. 4.
The object of these courses is to impart a thoroughly scientific training in this special branch of Applied Chemistry; and they are especially suited for Youths who are preparing themselves for positions of responsibility in this particular Industry. The Laboratory is open daily.
Special Evening Courses for Artizan Students.
For PARTICULARS and PROSPECTUSES of other Schools and Classes, apply to the SECRETARY.

By Order of the Directors.

THE SOUTHEND WATER-WORKS COMPANY.

SALE OF 500 SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 500 £10 SHARES (to be issued as fully paid) in the above Undertaking, ranking for a Maximum Dividend of 7 per cent.; the Dividend to the 30th of June last on the same class of Shares being at the rate of 5½ per cent. per annum.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

SALE OF SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 29 £10 SHARES in the Southend Gas Company, ranking for a Standard Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 7½ per cent.

Particulars of the SECRETARY, at the Offices, SOUTHEND, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of Executors and other Owners.

GAS STOCKS AND SHARES
IN THE
SOUTH METROPOLITAN GAS COMPANY,
NEW SWINDON GAS COMPANY,
UXBRIDGE AND HILLINGDON GAS COMPANY.
PORTSEA ISLAND GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Tuesday, Oct. 19, at Two o'clock, in Lots, STOCKS and SHARES in the above Companies.

Particulars may be obtained of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

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Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

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CANDLE SAFETY LAMPS

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COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

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165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

Now Ready, Price 10s. 6d.

WARNER'S DIAGRAMS
OF THE ANNUAL
AVERAGES OF PARLIAMENTARY RETURNS RELATING TO GAS UNDERTAKINGS,
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Together with the Private and Public Undertakings Grouped—1895 and 1896 Workings.
COMPILED BY
W. J. WARNER, of South Shields.

These Diagrams, which were noticed in the "JOURNAL" for Aug. 24, 1897, may be had of

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Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

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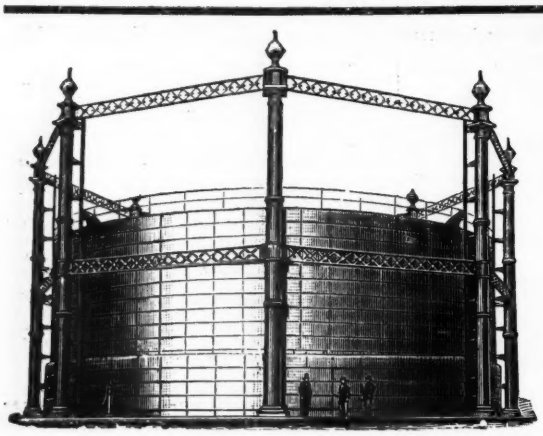

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GAS-METER MAKERS.

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The Company has also ACQUIRED the entire PATENTS OF THE ABOVE-NAMED FIRMS, together with BROWNHILL'S PATENTS, which include the

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ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

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Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
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Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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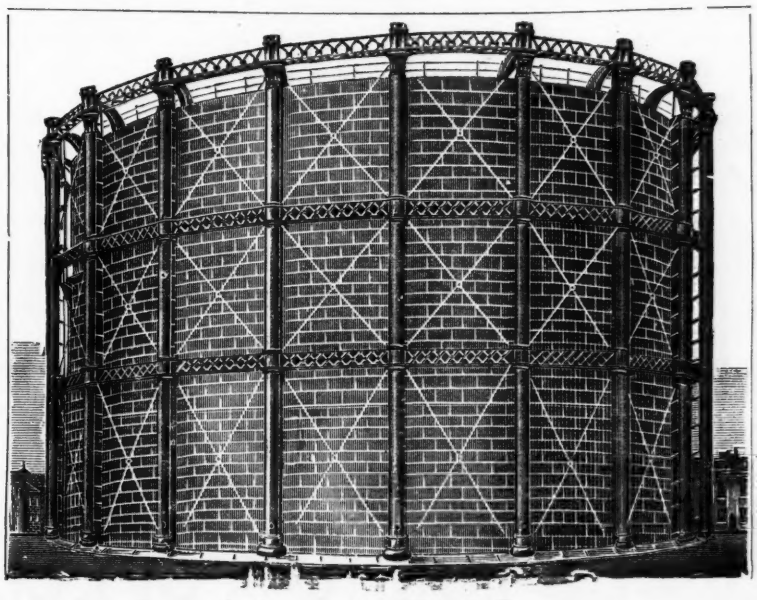

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BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
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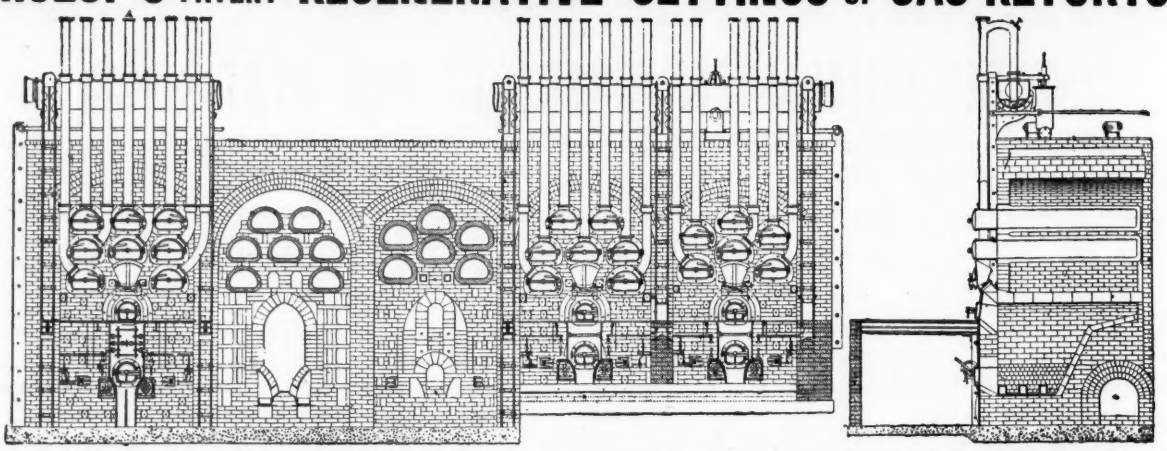

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Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland; Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., and to whom all Inquiries should be addressed in the first instance.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

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"ECLAIRAGE LONDON."

TELEPHONE No 43.
"HALIFAX EXCHANGE"

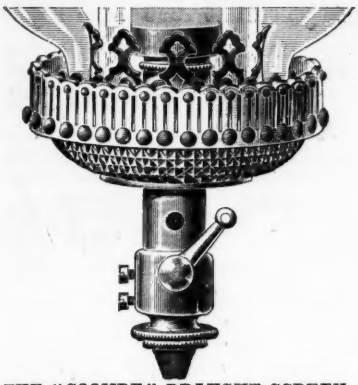
GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

JONAS DRAKE & SON
SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE
WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.
OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.



THE "COOMBE" DRAUGHT SCREEN.
Protection granted,
1896, No. 2075.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

ADVANTAGES.

1.—Prevents draughts of cold air from ascending the Chimney, and thereby lengthens the life of Chimney and Mantle.
2.—Prevents attempts to light spills, &c., in Bars and Restaurants, by which many Mantles are destroyed.
3.—Presents an ornamental appearance, which greatly adds to the beauty of the Burner.
4.—Prevents "Lighting-Back," and keeps out dust and dirt.

SOLD EVERYWHERE.

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"An Incandescent Burner without a Draught Screen is like a Man without a Collar."

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Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

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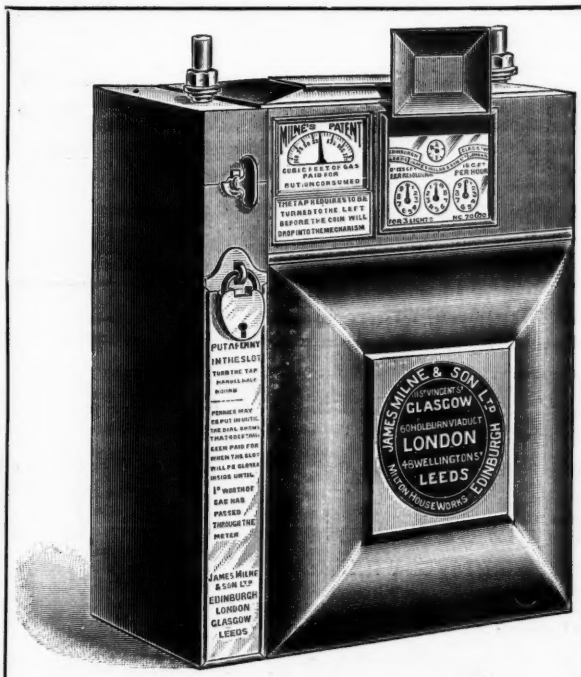
Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.


MILNE'S PATENT
1
CUBIC FEET OF GAS PAID FOR BUT UNCONSUMED
THE TAP REQUIRES TO BE TURNED TO THE LEFT BEFORE THE COIN WILL DROP INTO THE MECHANISM
PUT A PENNY IN THE SLOT
JAMES MILNE & SON LTD
EDINBURGH
LONDON
GLASGOW
LEEDS
JAMES MILNE & SON LTD
5 PRINCES ST GLASGOW
SCHOLEBURN VIADUCT LONDON
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MILTON HOUSE WORKS,

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MILNE'S PATENT PREPAYMENT DRY METER.

MOST compact Attachment in the Market.

Same Height as an Ordinary Meter.

Cast-Iron Attachment Cover, with extra large Money-Box, which is withdrawn while opening Door.

Absolutely Positive in Action.

The Whole Mechanism always in Gear.

The following unsolicited comparison has been sent us as showing the exact correspondence of amount due per Index and Cash in Money-Box with these Meters as against those of other Makers:—

Milne's Meter		due per Index	3/4	Cash in Box	3/4
Milne's	,,	,,	4/2	,,	4/2
Milne's	,,	,,	2/6	,,	2/6
Milne's	,,	,,	3/4	,,	3/4
Milne's	,,	,,	2/6	,,	2/6
Two other Makers.	,,	,,	6/8	,,	6/11
	,,	,,	1/8	,,	2/0
	,,	,,	3/9	,,	5/2
	,,	,,	2/6	,,	2/8
	,,	,,	4/7	,,	6/0

TELEGRAPHIC ADDRESS: "GAS, LEEDS."

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CLAYTON, SON, & CO.
LIMITED,
LEEDS,
MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
MACHINERY.

PRICES ON APPLICATION.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-Candle Power
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

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PARTICULARS AND PRICES FREE. AGENTS WANTED.

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Are now prepared to Tender for **SCRUBBER-WASHERS** fitted with their Patent Basket or Cage, with Improved Washing Surface. It is acknowledged to be the **MOST EFFECTIVE MACHINE** for extracting Ammonia and other Impurities from Coal Gas. It is guaranteed to Purify 20 per cent. more Gas in the same space, and at considerably less cost per Machine. The Baskets and Scrubbing Surface can be readily applied to all the sizes of the Kirkham, Hulett, and Chandler Machines now in use.

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(Established 1851),
GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,
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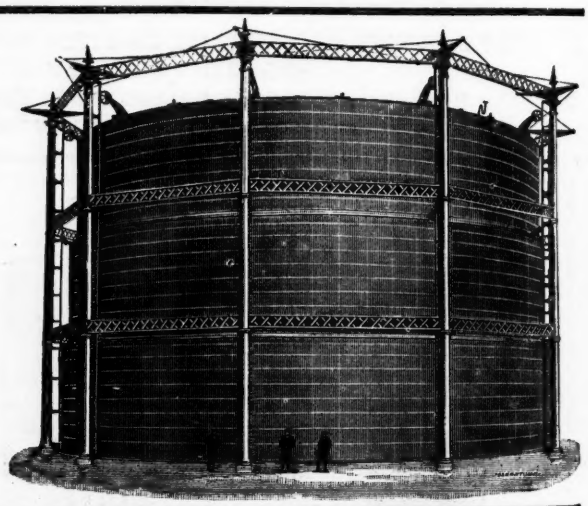
Gasholders and Gas Plant
OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



ALDER AND MACKAY,
MANUFACTURERS OF
IMPROVED WET AND DRY GAS-METERS
IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. COWAN.	G. GLOVER & Co.	JAMES KEITH.	D. B. PEEBLES & Co.
Total of Fast Tests . .	47·2 ..	6·9 ..	33·6 ..	62·3 ..	53·7
Total of Slow Tests . .	25·3 ..	117·4 ..	43·1 ..	31·4 ..	38·5
	72·5 ..	124·3 ..	76·7 ..	93·7 ..	92·2

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[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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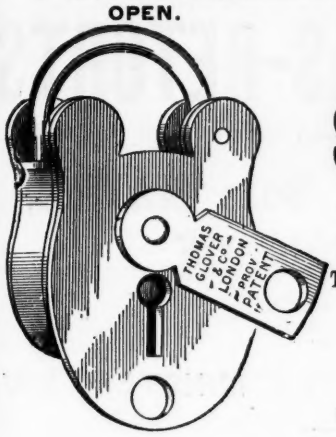

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PATENT

SECURE PADLOCK

Prevents Tampering with the
CASH-BOXES OF PREPAYMENT METERS.
The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark.
Eyelets easily fixed and removed by Company's Collector.

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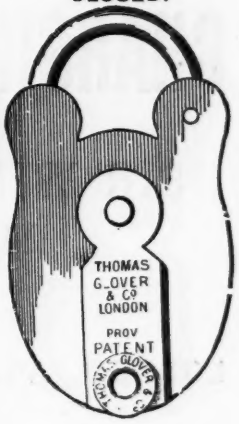

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

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Ask for Report by Professor Silvanus Thompson, D.Sc., F.R.S.

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(WITH ONE EXCEPTION).
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FOR

CHARGING AND DRAWING GAS-RETORTS

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SOUTH METROPOLITAN GAS COMPANY—
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COMMERCIAL GAS-WORKS—
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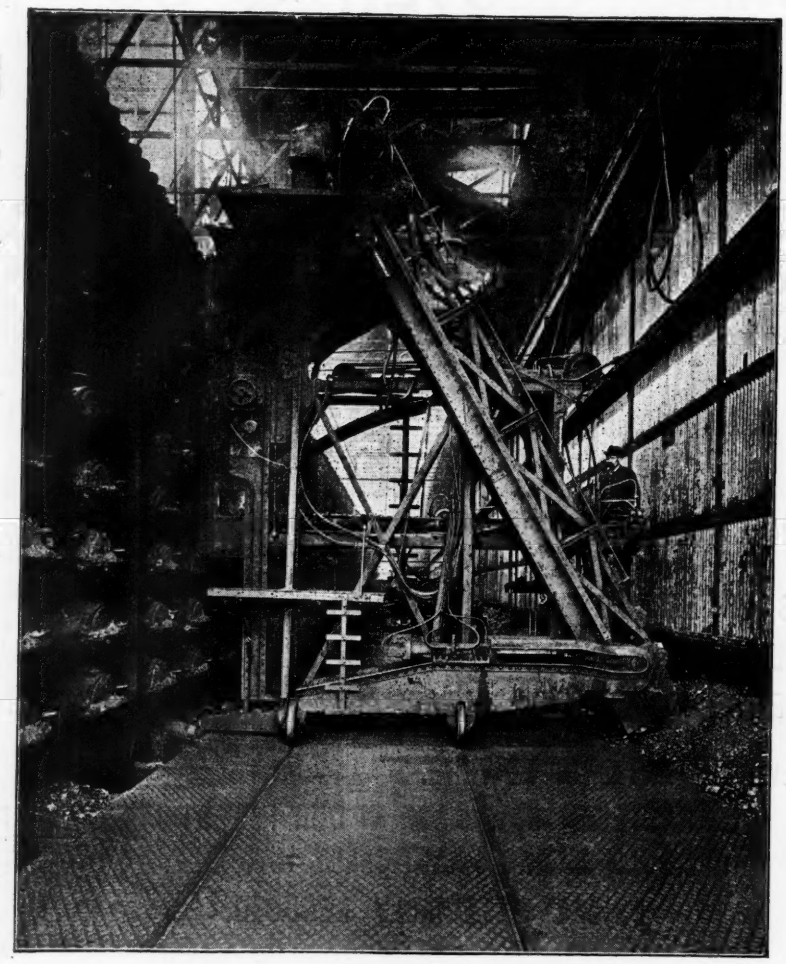
EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



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CONVEYING MACHINERY.

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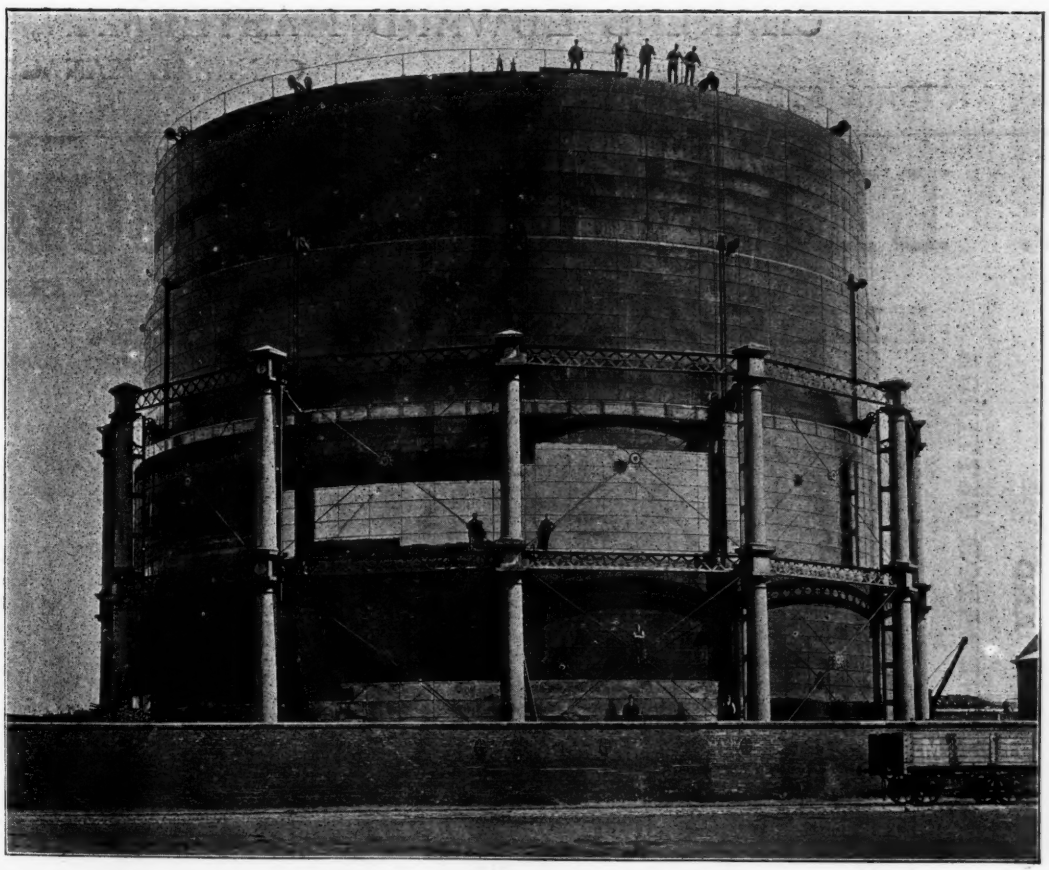
ON

PEASE'S STEEL CABLE SYSTEM.

Great Saving in Cost, and Absolutely Reliable in Working.

These Holders are certified by users to be STEADIER UNDER WIND PRESSURE than Holders with Columns.

INSPECTION INVITED. FREIGHTS REDUCED IN SHIPPING ORDERS.



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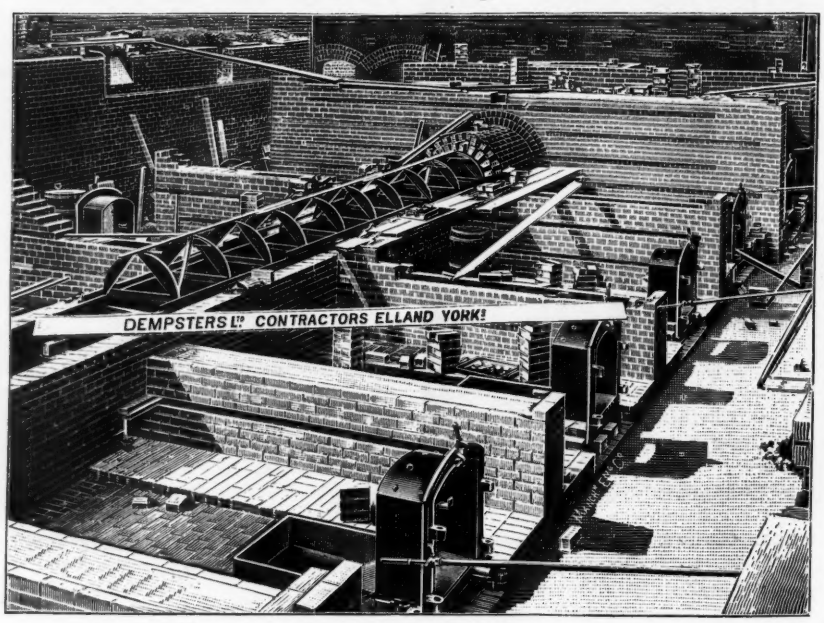

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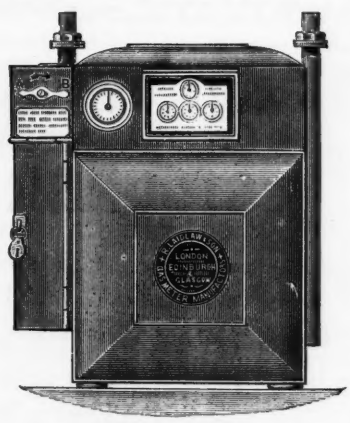

—DRY METER.—

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Write for Particulars, Testimonials, and References to
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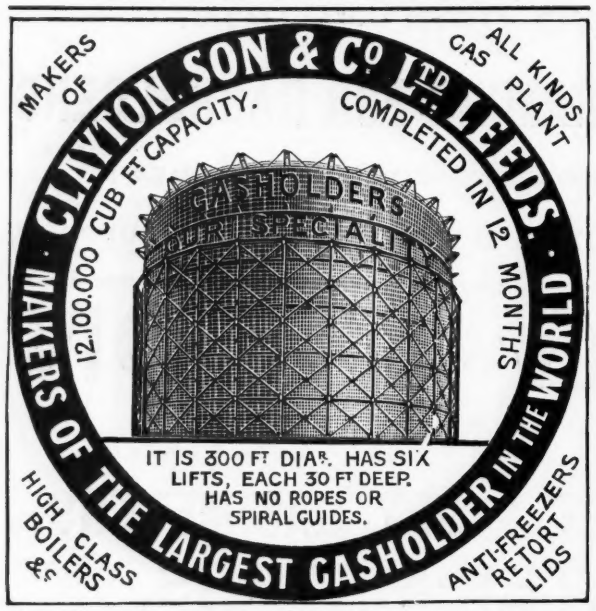
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12,100,000 CUB FT CAPACITY.
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3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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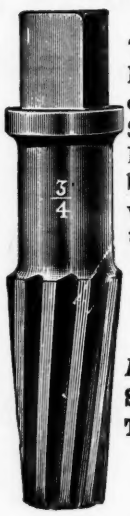
RYMERS & TAPS.



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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
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ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
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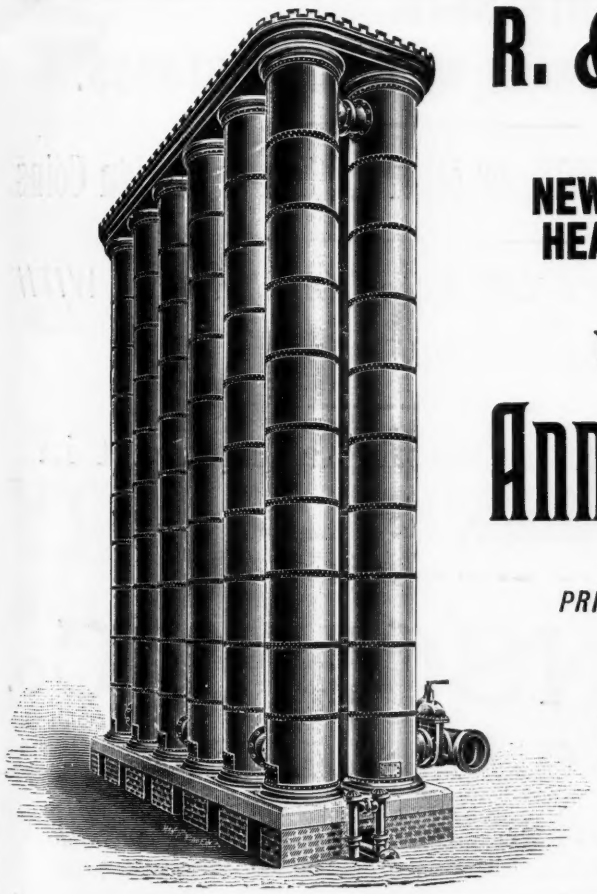

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[See also Advt. p. 724.

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